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May 1983

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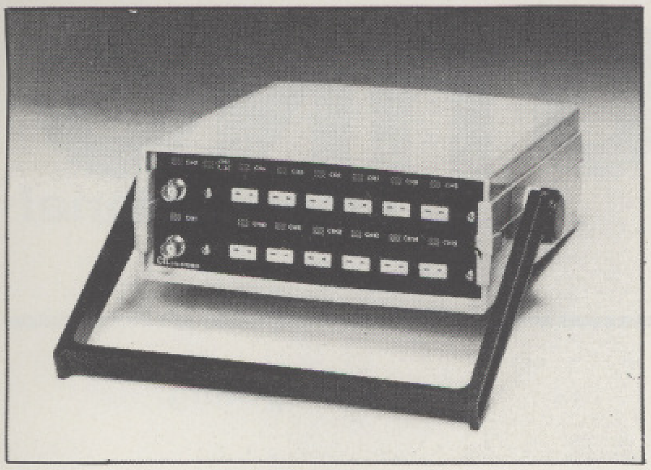
PCI 1002 IEEE THERMOCOUPLE CONVERTER



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Two other channels are provided via BNC input sockets on the front panel. Input ranges are I/V for 10 mV range and ±10V for 100mV range.

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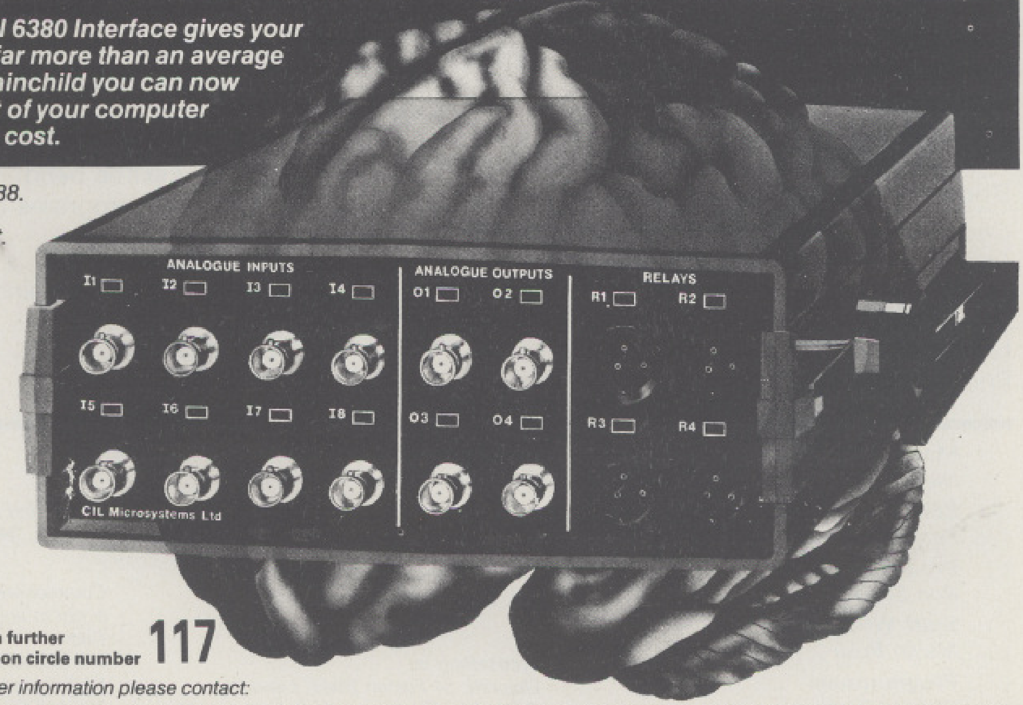

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Commodore considers moving to Corby

Encouraged by the fact that Britain accounts for 40 per cent of their home computer sales in the European market, Commodore are considering Corby as a possible site for their European manufacturing and distribution centre. The idea, still in the planning stage, is to transfer production of the VIC-20 and the 64 from Braunschweig, West Germany, leaving that plant to concentrate on business computers.

The new plant, which could create up to 200 jobs, would have an annual capacity of 700,000 units. It would produce machines primarily for the domestic market, with any surplus going to Europe.

Corby has its attractions. The high unemployment rate ensures a ready labour force and since the town lies within a Development Area and an Enterprise Zone, companies qualify for rent-free factories and grants from the Department of Industry.

Managing markets

Fulgard Markets have collaborated with Wego Computers Ltd of Caterham, Surrey, to produce a microcomputer-based system for managing street markets. The program, designed for use on a Commodore Pet, provides invoicing facilities and an up-to-date breakdown of each trader's account—whether bills have been settled or not, amounts outstanding, and attendance records at the various markets.

Useful information is stored, including stall numbers, positions favoured by traders and details of their merchandise. To help forward planning, the computer provides a printed plan of each market showing gaps still to be filled.

Obvious step

The markets are difficult to manage, with business expanding and traders travelling to the scuth-east from as far away as Humberside. Fulgard, who run markets in Caterham, Croydon, Lancing and Bognor, felt that computerisation was the obvious step. 'The Wego system has made our business more cost effective and efficient,' said Fulgard's Mr Robin Gardner.

The software is based on a modular approach to programming for the Commodore range which, claim Wego, offers advantages in terms of speed, flexibility and performance. Customers can use their microcomputers instead of investing in costly mainframe equipment.

Once the customer's needs have been defined and analysed, and the design and specification drawn up, the program can be written in a short time. The Wego approach is flexible; screen layouts and printouts are designed to suit the customer.

Data compression and fast retrieval of data from disk are features of the system.

For more information contact Mr Geoff Duck, Wego Computers Ltd., 22a High Street, Caterham, Surrey. (tel: 0883-49235)

Portable data collector for the PET

Consider the following specification: the full calculating, display, storage and printing capability of the PET computer in a device which is portable, self-contained and has a power source lasting several months.

Such a system is available from Mektronic Consultants. Called the TERMIPET, it comprises a portable data collection terminal interfaced to the PET. The terminal can store up to 32K of data which can be input through the keyboard and/or a bar-code scanner. It can be used for stock recording, incomplete records, market and industrial research, shop floor data collection, order recording, data processing and hospital patient records.

Previously usable only with large computer systems, the information from these terminals can now be down-loaded to the PET. The information is collected over a suitable period, say a day or a week. The data collector is then interfaced to the microcomputer. Data transmission takes place at about 4K per minute and the computer processes the information in the usual way.

Decoded

Data collection is enhanced by the use of bar-codes whereby the information contained in source-coded products (e.g. consumer goods on the supermarket shelves) can be decoded and used. Your own bar-codes can be used to specify clients and addresses, items in your catalogues, questions in a market survey etc. The bar-code provides a fast means of entry for such information.

The TERMIPET system, comprising 8K byte data collector, bar-code scanner, bar-code starter pack, interface card and software, retails for £848.00.

Further information from Mektronic Consultants, Linden House, 116 Rectory Lane, Prestwich, Manchester M25 5DB (tel 061-798 0803).

Check that cash

Especially for use on the 4000 and 8000 series is the Electronic Cash Book from Dataview. This is a menu-driven program offering nine main options and suitable for the inexperienced user. The Cash Book records the receipt and payment of money, whether in coins, notes, cheques or postal orders, the type of payment being split up into various codes of which there are 99 on the 8000 series and 60 on the 4000.

Whichever system it is being used on, the program covers a period of three months with a maximum of 1014 transactions possible on the 8000 and 450 on the 4000. Once payments are entered the system keeps a complete record including bank reference number, lease number, payee, amount paid to date, amount outstanding and bank charges, all of which can be printed on the screen or via the 8023, 8300 and 4022 printers.

The price of £195 includes a manual and security key.

Area: Accountancy.
Company: Dataview.
Address: Portreeves House, East Bay, Colchester,
Essex CO1 2XB.
Tel: 0206-869414/865835.

Security tag

Eureka Systems (Dormley House, Upton Road, Slough SL1 2AD, tel 0753-37722) have developed an access control system comprising a small tag and a sensor. The tag contains a unique code which can be detected and verified by a sensor up to three metres away. The sensor can be installed out of sight behind a wall or on the ceiling, since the tag works through many materials including brick, steel and leather. It can be kept in the user's bag or pocket. The non-rechargeable battery has a life of about five years.

Total service package

The Computing Services Association, a trade body representing about 200 companies and organisations, provides services to government, industry, commerce and the media. Operating through councils, committees and interest groups, the CSA offers facilities for processing client data, either with standard packages supplied by the bureau or packages tailor-made for the client.

CSA consultants will help clients to plan, develop and implement computer systems, plus education and training. Systems are designed for vertical marketing, although cross-industry applications such as general accountancy are still popular. There is also a free commercial enquiry service; customers give details of the service required to the CSA and these are then circulated to all the members on a weekly basis.

A code of conduct obliges members to express terms of agreements clearly and fulfil the agreements, to help eliminate confusion arising from terminology, and to provide proper security for client information.

Area: General services.
Company: Computing Services Association.
Address: Hanover House, 73/74 High Holborn,
London WC1V 6LE.
Tel: 01-405 2171/2 and 01-405 3161/2.

New design desks

Now that Commodore have released the 500 and 700 series, Tirith Ltd have not been slow in updating the Crompton computer desk to accommodate the new machines and their peripherals. The surface area of the worktop now measures 1,170 × 680 millimetres. Other improvements have also been made. Instead of having cable clips beneath the desk-top, the cables are installed in a hollowed-out bar on a pivot which runs across the back of the desk.

Also for ease of access, the 13 amp sockets have been positioned on the back frame and the paper feed is provided for by means of a gap between the back of the desk and the cable facility. Six versions of the desk are available, some fitted with a second disk drive shelf and a large or small top extension. Prices range from £180 to £260 ex-works, not including VAT. Payment should be with the order or within 30 days.

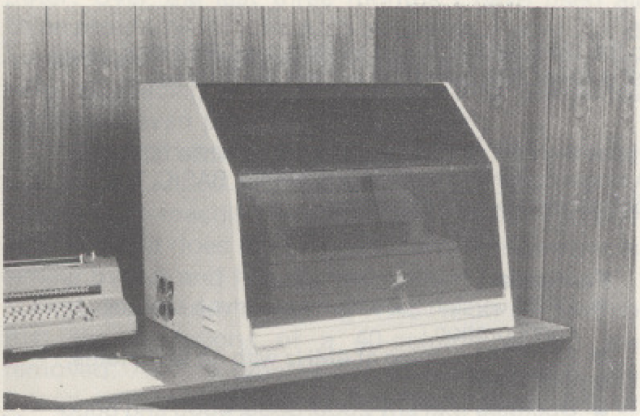
Area: Worktops.
Company: Tirith Ltd.
Address: Pear Tree House, Woughton-on-the-Green,
Milton Keynes MK6 3BE.
Tel: 0908-679528.

Reducing printer noise

Available from Ventguard is a new range of metal acoustic covers designed to fit most word processors and tractor feed printers. The Universal Type 1 fits onto Commodore, Qume, Diablo and many other printers. It reduces noise from the printer by as much as 90 per cent. To prevent the machine getting too hot, an electric fan is a standard fitting.

The Universal Type 2 and 3 also fit the Qume and Diablo, but they differ in height and depth. Type 3 has a one-piece construction, the base section joining the cover. Both 2 and 3 are for most word processors and printers using the Rutishauser or BDT sheet feed systems. Each cover is fitted with a three-core, 13 amp electric cable and three-pin socket with a standard three-amp fuse.

Area: Equipment.
Company: Ventguard.
Address: Unit 12, High View Avenue, Keyworth,
Nottinghamshire NG12 5EL.
Tel: 06077-5856.

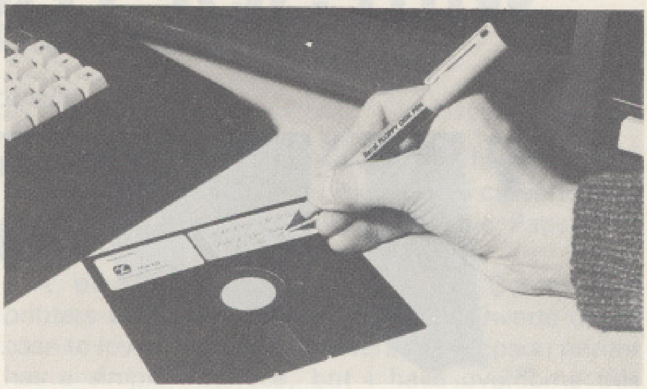


Ventguard acoustic cover

Cleaning printer wheels

Innovative Computer Products offer print wheel cleaner kits with adaptors to suit Qume and Diablo printers. Each kit contains a cleaning pad made of deep-pile fabric and a 118ml bottle of ICP cleaning fluid. To clean the print wheel a shaft that passes through the lid of the container is used to hold the print wheel and rotate it against the cleaning pad. The kit, priced at £16.40 (refills £7.90 each) is available from Action Computer Supplies, who offer a same day dispatch service.

Area: Cleaning products.
Company: Action Computer Supplies.
Address: 6 Abercorn Trading Estate, Manor Farm
Road, Alperton, Wembley,
Middlesex HA0 1WL.
Tel: 01-903 3921.



Berol floppy disk pen

Floppy disk pen

To prevent damage to floppy disks, Berol Ltd have introduced the Floppy Disk Pen. The surface of any floppy disk is extremely sensitive to touch. Writing has to be done on the protective sleeve, but even this can damage the disc if you press too hard.

Using the Berol pen, when the writer presses too hard the nib bends away from the surface before the floppy can be damaged. If the nib is damaged it can easily be straightened out. The pen is available in four colours—blue, green, red and black—and costs 45 pence.

Area: Accessories.
Company: Berol Ltd.
Address: Oldmedow Road, King's Lynn,
Norfolk PE30 4JR.
Tel: 0553-61221.

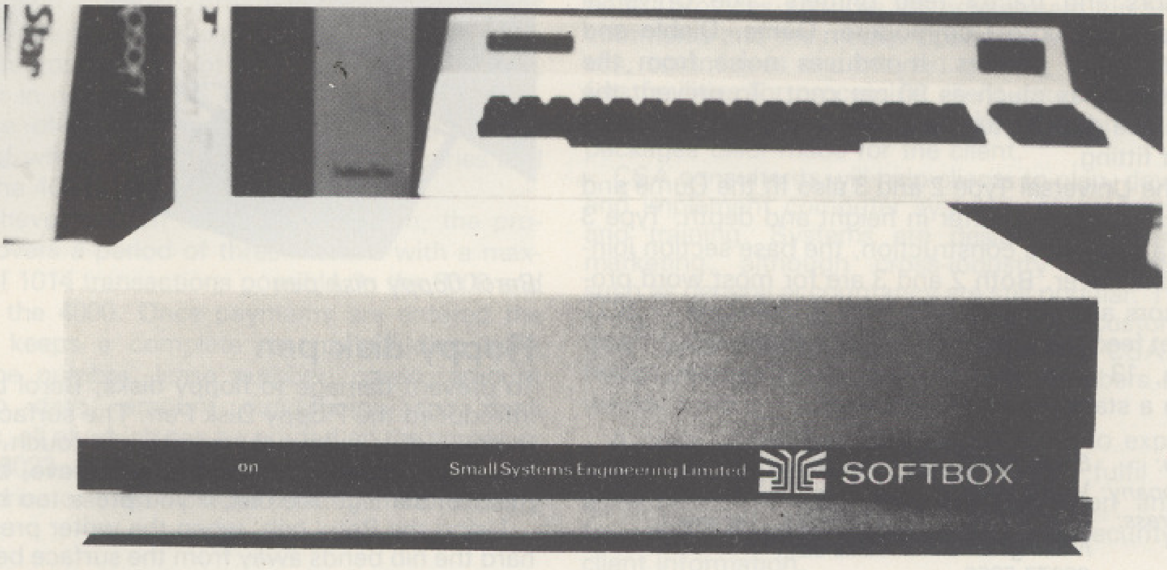
Serving users and dealers

Raben-Christensen are providing a new service for Commodore dealers and customers—a systems analysis and programming package in Silicon Office and standard machine languages. According to Ian Hyde, the company's sales manager, users of Silicon Office and similar systems are often inexperienced and encounter problems when they try to set up complex systems.

Raben-Christensen, who are able to offer the service on a national basis, will be charging £120 a day plus expenses. A package that includes order processing, stock control and sales ledger to trial balance will cost less than £1,000.

Area: Consultancy.
Company: Raben-Christensen.
Address: Foundry Lane, Horsham,
West Sussex RH13 5TZ.
Tel: 0403-69696.

Run CP/M® on Commodore with SOFTBOX



Simply by plugging the Small Systems SOFTBOX into the IEEE-488 port and loading the CP/M disk, your Commodore PET/CBM will run under the world's most popular disk operating system. No internal connections or modifications arequired.

A complete computer system in itself, the SOFTBOX uses the PET or CBM as its terminal while talking to any combination of Commodore and Corvus drives. A single command returns you to PET BASIC. The SOFTBOX utility disk gives you complete software control over your configuration.

Terminal Emulation
Applications packages designed to work with specific termals (like ADM3A, TV1 912 or Hazeltine 1500) will need no modification for the 80-column CBM, since the SOFTBOX allows your computer to emulate any of these devices.

Add Corvus Hard Disk
Expand your CP/M file storage capacity with reliable Corvus drives. With the Corvus Mirror Option and a standard video cassette recorder, you have a fast, inexpensive disk backup. When you purchase the SOFTBOX and Corvus from Small Systems, you'll receive everything necessary to convert your Commodore to a hard disk-based CP/M system.

Features
- CP/M version 2.2 with menu driven system configuration.
- Z80 CPU running at 4MHz with no wait states.
- 64K RAM
- Operates with any 2000, 3000, 4000 and 8000 series Commodore computer.
- Supports up to 8 Commodore 3040, 4040, or 8050 disk drives.
- Supports up to 4 Corvus hard disks of 6, 11, or 20 MBytes.
- RS232 serial interface with software-definable baud rates for use with a printer, modem or terminal.
- Diskette containing operating system with utilities.
- Comprehensive user manual.

A full range of CP/M languages and applications software on Commodore 8050 or 4040 format is available.

small systems engineering limited
2-4 Canfield Place, London NW6 3BT. Telephone: 328 7145 Telex 264538

Three budget programs for word processing

David Hornsby

The owner of a Commodore computer has a wide range of good word processor programs to choose from. But since they cost £200 or more, they are probably beyond the pocket of the average school/amateur/home owner.

This does not mean that word processing is ruled out for these users. There are a number of budget programs available, some of which are very good. The three programs reviewed here cost less than £50 each, work with either tape or disk and represent good value for money.

If you own a PET/CBM computer and a printer but can't afford one of the £200-plus word processor programs, you should consider these three packages, which extend the potential of your computer. Over the last three months I have used all three programs for jobs such as personal letters (and 'undercopies'), duplicating babysitters' lists for my wife, producing a letter to insert into Christmas cards and even preparing this review.

Pagewriter

This is a 2K machine code program which you buy as a ROM. It does not provide many facilities but is simple to use and has some excellent points.

First, it provides a moving window on the text so that the limitations of a 40-column screen are removed. As you type or use the cursor keys, the screen contents appear to move up, down, left or right as if they were a sheet of much larger paper behind the screen. When it comes to print out, what is on the 'electronic paper' is what is printed.

Formatting has to be done manually on the screen; this makes it virtually foolproof although tedious. Insertion and deletion of text are done in much the same way as for a Basic program, but it destroys the formatting of all text following the amendment. A special command mode allows deleted words or lines to be re-inserted elsewhere and if you stick to whole lines then formatting is not destroyed.

Characters

Two noteworthy features: the ability to embed any number of up to 26 separate user defined characters (such as pound sign, mathematical symbols and graphic shapes) into your text for printing on a CBM matrix printer (this works a treat); and the fact that the text is made to appear to the computer as a Basic program; it can be saved much faster on tape than a sequential data file. High-speed cassette tape routines such as Arrow will also save Pagewriter text with the usual speed advantages.

A possible problem is that non-Commodore printers will need an interface that converts upper case to lower case and vice versa. My Epson printer has a simple interface, but I have overcome this limitation with a short machine code routine which I run just before print-out. This flips the text on the screen the wrong way round but the printed copy emerges the right way round.

The documentation that comes with the ROM is brief but adequate; I had no trouble working out how to use the program.

I have found Pagewriter to be most useful for producing short reports containing many rows of figures which need aligning, since the manual formatting features are so easy to use and layout may be planned at the keyboard. For other uses I opt for the second or third programs described.

Papermate Plus

Papermate Plus is written in Basic with some machine code routines to speed up critical operations. An enhanced version of the original Papermate program, it's a clever piece of software that provides so many facilities that I have yet to use all of them.

A professional typist would find typing speed limited by the speed at which the program can input text, but I have found it quite fast enough for an experienced 'five finger and thumb' non-typist.

Formatting is performed at print time by the use of in-text format commands and virtually any type of printer may be used. The keyboard may be redefined to individual requirements and elaborate editing is possible.

However, it is here that Papermate shows signs of weakness; although it can handle complex editing, it is slow and sometimes fiddly to use. Many of the commands are only provided to try to overcome the limitations imposed by the program being written virtually entirely in Basic. If you don't have the fast garbage

Pagewriter is most useful for short reports containing many rows of figures which need aligning. The manual formatting features are easy to use and layout may be planned at the keyboard.

collection of Basic 4 ROMs, you will find that the program hangs for a few seconds from time to time.

Forms and files

There are some advanced features. Form-filling (e.g. linking a mailing list to a standard letter to personalise it) is supported. Text linking is provided to extend the memory capacity of the computer so that long documents may be prepared and printed (useful to an author) and use may be made of relative files.

On the other hand, Papermate is not an easy program to learn or use. I have to refer constantly to the fairly helpful documentation provided to make use of some of the commands. Furthermore, I often find that if I try any fancy layout commands, then what is printed is often not what I expected. Invariably this is my fault, but it can be difficult to see the cause of the error at times.

The rare crash that occurs with the program is not a serious bug but is caused rather by stack overflow. Don't worry about it, as a GOTO900 allows you to continue with nothing lost.

Wordpower

The father of Wordpower was a Basic program published in *Personal Computer World* two years ago. That was a successful attempt at a word processor program and I used it for a time. The machine code version now available is a terrific improvement and offers thoroughly professional, low-cost word processing.

It supports any printer and although it has fewer commands than Papermate it is comparatively easy to use and superb for editing. Many users consider the PET screen editor to be among the best yet devised for the microcomputer and Wordpower offers one of the best text editors of any microcomputer-based word processor.

Fast scrolling up or down, line by line or screen by screen is provided. Text is automatically 'word-wrapped' so that a word is never split at the end of a line on the screen but wraps onto the next.

There is little need for repeated reference to the helpful manual since the top four lines of the screen maintain a constant menu of all the commands available in each of the modes of operation.

Text linking is provided to extend the memory capacity of the computer so that long documents may be prepared and printed.

The cursor may be moved anywhere as normal; inserting and deleting text is a real joy. When deleting, it is virtually impossible to make an error since all text to be deleted is put into reverse field so you can precisely identify what you are about to lose.

Wordpower also maintains a buffer memory which stores deleted text. The copy command allows this text to be inserted elsewhere, if necessary many times since the buffer is not changed until the next use of the delete command. This is a simple idea which is both easy to use and powerful.

Superior editor

As a bonus to users of the Commodore Assembler, Wordpower will prepare compatible source text and is a superior text editor to the standard Commodore one.

Before printing text onto paper, Wordpower allows a test print onto the screen so that you can check the formatting and paging of the text. This can save you paper and time.

The limitations of Wordpower are merely the lack of some of the advanced facilities of Papermate. Chief of these for me is the ability to link text. This may be overcome to some extent by using the screen printing facility which allows really long text to be split at a page boundary and stored separately, then printed in sequence.

When deleting, it is virtually impossible to make an error. All text to be deleted is put into reverse field.

Papermate's facilities are superior here, but the 12 or so pages of A4 text that may be stored by Wordpower on a 32K machine should prove enough for most purposes.

Conclusion

All three programs are good. Top on my list is Wordpower, but if form-filling is important then you will have to choose Papermate. Pagewriter, being in ROM, is very handy and might appeal to non-disk users because of the speed and ease of its use with tape.

The best advice I can give is to suggest that you look at the table of features and draw your own conclusions. Unfortunately, your local dealer is unlikely to be able to give you a demonstration of any of these programs. Being budget products, they are available only by mail order.

Comparison of features

	PAGEWRITER	PAPERMATE+	WORDPOWER
Price	£39	£45	£41
Available from	Supersoft	Supersoft	K.Pretorius
Supplied as	2K ROM	tape or disk	tape or disk
Language	machine code	BASIC + m/c	machine code
BASIC 2/3/4	yes	yes	yes
Max. text(A4) approx.	3 pages	9 pages (19K bytes)	12 pages (23.5k bytes)
Text linking	no	yes	manual only
Memory counter	yes	no	yes
Printer	Commodore preferred	any	any
Printer commands	only char.-mode	yes but fiddly	yes
Printing speed	very fast	fast	very fast
Adj. page size	only at turn-on	yes	yes
Page numbering	no	yes	yes
Double spacing	manually only	yes	yes
Margins	no	yes	yes
Right justifying	no	yes	yes
Tabulation	no	yes	yes
Centering	no	yes	yes
Keyboard definable	no	yes	no
Typing speed	professional	fast amateur	professional
Editing	limited	good but fiddly	superb
Find with repeat	no	yes	yes
Find with change	no	no	yes
Move text block	yes	yes	yes
Wordwrapping	no	sometimes	yes
Printout preview	yes	no	yes
Multiple copies	upto 9 only	yes	yes
Form letters	no	yes	no
Tape use	yes	yes	yes
Disk use	yes	yes	yes
Disk commands	no	BASIC 4 only	yes
Text saved as	BASIC program	seq. file	seq. file
Number of commands	low	very high	moderate
Ease of use	good	fair	good
Known bugs	none	stack overflow	none

Choose your own commands

There have been countless programs, on tape or disk, or contained in ROM, that have added commands to the existing PET Basic. Ideally the program you buy should be burnt into ROM and then simply installed in your machine, to avoid the loss of valuable memory space in the computer.

However, even working in this way there is one major fault with all the previously available ROM add-ons. What you pay for is what you get, it doesn't matter if there are five additional commands on the chip that you will never use. You've still paid for them.

To overcome this problem Whitby Computers, of Whitby, North Yorkshire, have come up with a novel idea that deserves to be a success.

It's your choice

Instead of presenting you with, say, 10 extra commands, you are invited to choose your own set of commands from a list that currently totals 78. Not all of these are Basic commands, some are new functions, but the total remains the same.

How do you go about choosing these commands? In Whitby's literature you are presented with a list of them and a brief summary of what they do. Alongside each one is a figure giving the number of bytes of memory it will occupy—the amount of space, in other words, required to implement that command.

> *When you've reached 3,700 you send off your order and back comes a chip with your new commands burnt into it.*

You can choose around 3,700 bytes worth. While selecting commands you keep a running check of the total number of bytes you've consumed. When you've reached 3,700 you send off your order and back comes a chip with your new commands burnt into it. All you have to do is fit the chip into your computer. You choose which socket it is to go in, thus allowing you to have two Whitby chips in your machine at the same time, if you wish. Then type the appropriate SYS command to initialise it.

Capabilities

Careful selection of new instructions and functions should allow you to build up a powerful library to extend the capabilities of your machine. Some of the commands though, I can't see as being particularly useful.

For instance, I would regard 100 bytes to draw a border around your screen as a waste of 100 bytes! Do that yourself in Basic (or machine code) and save that valuable space in the chip for something a bit more useful: say automatic line numbering and disabling the run/stop key without affecting the internal clock.

All the 'standard' additions are available, such as renumbering, block deleting, dump, merge and replacing all occurrences of a given character string with another. By carefully choosing each one, you can easily assemble a collection of commands for handling disk drives, looking after printers or performing various input checks.

Structured Basic, should you require it, is available with the new commands CIF, ELIF, CEND, ELSE: a valuable 220 bytes worth! Of course, if you write your programs in structured Basic they won't run on any other machine without the addition of another Whitby chip.

Criticisms

Mercifully this will not be one of the longer sections of this review! My main gripe concerns the manual, which is simply a set of photocopied sheets of paper, one per command, stuck together. To save expensive printing costs, the company photocopies the pages for the commands you have chosen and puts them together. Not exactly attractive, but at least it tells you what you need to know.

The command instructions, however, should and could be more detailed than they are at present.

Conclusion

Available for any Basic 2 or 4 PET (but not Vics and 64s: yet!), this is a useful aid for any programmer. Selectability is its main selling point, and on this alone it should do well. The documentation could be improved, but that is a minor point. Some of the commands are clearly superfluous, and are simply there to make the advert look better, but you don't have to choose them : the end result is up to you.

Area : *Program development.*
Product : *SoftChip.*
Price : *£45.00.*
Configuration : *Any Basic 2 or 4 PET.*
Company : *Whitby Computers Ltd..*
Address : *8 Chubb Hill Road, Whitby, North Yorkshire.*
Tel : *0947 604966.*

Hiding PET programs with the list lock routine

Steven Darnold

Adventures are very popular at my school. Every month or so, I take in a new adventure and give a prize to the first pupil to complete it. Needless to say, the school's three 16K PETs get used with particular enthusiasm when a new adventure arrives.

It was obvious from the beginning that I would have to do something to hide the program listings from inquisitive eyes. The temptation to get a 'hint' from the listing is just too great. I considered writing the adventures in machine language, but the time required for this would rule out monthly adventures (I would be lucky to write one a year!). I considered buying a BASIC compiler, but the prices are just too high. I considered storing all text as data files, but several pupils would have little difficulty unravelling such files. The only viable alternative was to write a normal BASIC program and then lock the listing.

The key

The first time I loaded a VIC program into my PET, I was surprised to find that I could not list it. After some fiddling around, I discovered that I could list the program if I moved the start-of-BASIC pointer to $1001. However, when I then loaded a normal PET program, I could not list it until I had moved the start-of-BASIC pointer back to $0401. This is the key to locking a listing. As long as the start-of-BASIC pointer is not pointing to the program, it cannot be listed.

When I want to lock a program, I start it 57 bytes beyond the normal start-of-BASIC position. This keeps the user from listing it. However, it also keeps the user from running it. In order for a program to run, the start-of-BASIC pointer has to be pointing at it. Therefore, in the normal start-of-BASIC position, I put a machine language routine which resets the pointer. A LIST shows only '100 SYS1037' but a RUN finds the program via the machine language.

Special routine

While the program is running, the start-of-BASIC pointer points to it. Consequently, if the program stops suddenly, it can be listed. It is essential, therefore, to keep the user from breaking out of the program. The stop key must be disabled and a special input routine used to keep the user from jumping out of the program. Also, the program must be examined to eliminate any conceivable break due to such things as string too long and overflow errors.

Just before the end of the program, the start-of-BASIC pointer must be poked back to its usual position. Otherwise the user will be able to list the program at the end. Moreover, if the user loads a new program, he will not be able to find it unless the pointer is back to normal.

It should be noted that, although the locking procedure erects a tangible barrier, even more potent is the psychological effect. The opening SYS statement gives the impression that the entire program is in machine language. Few users will suspect anything beyond that (particularly since some compiled programs run little faster than normal Basic).

The rest of this article details the locking procedure for a PET with upgrade or 4.0 ROMs. Users of other Commodore computers should be able to adapt the procedure without too much difficulty.

For a program to run, the start-of-Basic pointer must be pointing at it. Therefore, in the normal start-of-Basic position, I put a machine language routine which resets the pointer.

Routine 1 goes in the normal start-of-Basic position. It can be inserted into an existing Basic program by entering a dummy first line, made up of a REM and 50 asterisks. This leaves just enough room for the routine to be typed in from the machine language monitor.

```
.: 0401 0B 04 64 00 9E 31 30 33
.: 0409 37 00 00 00 A9 93 8D 6F
.: 0411 02 A9 52 8D 70 02 A9 D5
.: 0419 8D 71 02 A9 0D 8D 72 02
.: 0421 A9 04 85 9E 78 AD FF FF
.: 0429 85 91 AD FE FF 69 16 85
.: 0431 90 58 A9 39 85 28 60 00
```

```
0401 0B 04           link to next program line (at
                     040B)
0403 64 00           line number (=100)
0405 9E 31 30 33 37  SYS1037
040A 00 00 00        end of program
040D A9 93 8D 6F 02  puts CLEAR-SCREEN in
                     keyboard buffer
0412 A9 52 8D 70 02  puts R in keyboard buffer
0417 A9 D5 8D 71 02  puts shifted-U in keyboard
                     buffer
```

```
041C A9 0D 8D 72 02 puts RETURN in keyboard
                    buffer
0421 A9 04 85 9E    puts 4 in buffer counter
0425 78             disables interrupts
0426 AD FF FF       fetches value from jump
                    table
0429 85 91          stores in hardware interrupt
                    vector
042B AD FE FF       fetches value from jump
                    table
042E 69 16          adds offset (to disable stop
                    key)
0430 85 90          stores in hardware interrupt
                    vector
0432 58             clear interrupt disable
0433 A9 39 85 28    puts $39 in start-of-BASIC
                    pointer
0437 60             end of machine language
0438 00             marks start of main program
0439 ?? ??          link to next program line
043b ?? ??          first line number of main
                    program
```

This routine performs three tasks. First, it sets keyboard buffer values in such a way that a RUN is executed when the routine ends. Second, it disables the stop key by causing the interrupt vector to skip the stop key servicing routine. Third, it changes one byte of the start-of-BASIC pointer from $01 to $39, thereby moving the start of BASIC from $0401 to $0439.

Routine 2 goes into the main program as a subroutine. All INPUT statements are replaced by GOSUB 60000. The input is returned as IN$.

```
60000 IN$=":POKE158,0:POKE167,0
       (clear input string and buffer, turn on
      cursor)
60010 WAIT158,7:GETZ$:Z=ASC(Z$):IFZ   95
      THEN60010  (get one character, reject if too
      big)
60020 ZL=LEN(IN$):IFZL   38THEN60040
      (reject character if string too long)
60030 IFZ   31THENIN$=IN$+Z$:PRINTZ$;:
      GOTO60010 (add character to string if not
      too small)
60040 IFZ=13ANDZLTHENPOKE167,1:PRINT'
      ':RETURN (turn off cursor and exit if
      RETURN pressed)
60050  IFZ=20ANDZLTHENIN$=LEFT$(IN$,ZL-
      1):PRINTZ$; (delete character from string if
      DEL pressed)
60060 GOTO60010
```

Advantages

This routine has many advantages over a normal INPUT and can be used in all sorts of programs. First, it does not drop out of the program when RETURN is pressed alone (line 60040 rejects RETURN if ZL=0). Second, it will not accept out-of-range characters (set maximum ASCII value in line 60010, set minimum in line 60030). Third, it rejects all cursor control characters except delete (which only works if there is something in the string to delete). Fourth, it limits the length of the input (set maximum in line60020). The input length must be less than 255 to avoid the possibility of a STRING TOO LONG error.

The third part of the locking procedure is the simplest of all. Everywhere it ends, the main program must end in this way:

```
POKE 40,1 : END
```

This returns the start-of-Basic pointer to the normal position. A person then listing the program will find only '100 SYS1037'.

Dealing with a null return on input

One of the drawbacks of the INPUT statement is its inability to handle a null input. If the return key is pressed without inputting any data, the machine will exit from the program. To get the INPUT statement to accept a null string the statement must be structured in such a way that a character will always be automaticall input.

This is done by following the INPUT statement with a string which is terminated by three carriage returns. When run this results in the cursor being placed over the last character of the string, and if the return key only is pressed then this character will be input thus:

```
100 INPUT "Is the disk inserted Y or N
    cl cl cl";A$
110 If A$="N" then GOTO 500
120 GOTO 400
```

As can be seen from the above example, this method is excellent for inputting default parameters since the user only has to press carriage return in response to the question if the default situation is required.

Choosing the equipment

Robert Moscrop

Evaluating computer equipment for a company information system is a complex process. The user must know what he wants and what hardware and software will suit his needs.

Having defined the needs of the company, it is now possible to work out a solution. The maxim contained in the introduction to this series is worth repeating: Caveat emptor. Let it be known that you are in the market and your phone will not stop ringing and you will soon lose the respect of your postman.

Your first step is to produce a statement of requirements , often called a 'bid spec'. The preparation and production of this document is far more important than might at first appear, for not only does it set out the needs of the company, but it sets the standard by which the responses will be judged.

The following may be used as guidelines in drawing up the document for suppliers:

1. **Statement of objectives**
This will be a description of the disciplines (logic) of the procedures to be adopted in business terms, together with the desired output and proposed input, identifying 'musts' against 'wants'.
2. **Detailed specification**
This will comprise a flow chart as discussed in the previous article, which traces the flow of information through the system.
3. **Quantification**
The volumes of data to be handled in terms of input and output. In both cases the minimum/maximum/average volumes should be noted in addition to exceptional 'high' peaks and data conditions.
4. **Control**
The degree of security/control/confidentiality required to be exercised on the data. It is advisable to let your auditor read the document before publication, as he may want to add a few audit trails.
5. **Development**
It should be noted whether this is a 'stand alone' application or whether it is to be expanded into a more sophisticated routine at a later date (see 'Recording systems' in the second article).

Robert Moscrop, director of Computotech Ltd, is a widely experienced systems analyst and designer. Since 1978 he has been developing training systems for the Manpower Services Commission and working as a consultant.

Implied in the foregoing is the fact that the first thing to buy is the software—programs that will meet your needs.

The next step is to determine which potential suppliers will get the spec. The popular microcomputer journals or software directories will reveal many such software houses offering packages in general terms, e.g. 'financial accounts' or more specifically, accounts receivable , etc. To reduce this list, a short introductory questionnaire might be useful, seeking answers to the following points:

1. Do you have a package covering 'x' application?
2. Date written?
3. What amendments or updates have been made?
4. Is the company the originator? If not, who is?
5. How many have you sold?
6. What facilities are available for maintaining support for the package in the event of new legislation or logic failure? Who will make these facilities available and within what time?

Revealing

The promptness and quality of the replies to even such a simple questionnaire can be revealing. They will help you to draw up a short-list of suppliers. At the same time, a standard evaluation procedure should be set up. Topics covered should include:

1. Evaluation criteria.
   a) Cost/benefits
   b) Reliability of the package—past record.
   c) The installation package offered, including take-on, training, maintenance and documentation (who pays?).
   d) Maintenance and expansion—who pays?
2. Feature analysis mechanism.
3. Product testing.
4. Vendor testing.
5. Support documentation.

Proposals submitted against the bid spec can then be evaluated in a more orderly manner. A points rating of 1-5 can be given to each topic and allocated against each heading, although this will of necessity be somewhat subjective. The statistical concepts of 'best fit' and S.D. can be applied to the list of submissions in order to short-list a few possibles.

The next step is that of 'proving' the packages. This will involve arranging to have the package demonstrated preferably using your own data, although this will be more time consuming, hence costly.

In evaluating the demonstrations, the following points may be used as a check list:

1. Timing, processing and response may vary on different machines.
2. Exceptional conditions.
3. Error conditions.
4. Audit control mechanism, security and back-up facilities.
5. Facilities used or missing.
6. User friendly.

This exercise will help you to choose the package best suited to your needs. It should not be assumed that the package can be installed 'as is'; modifications may have to be made, for example, if you wish to amend or produce bespoke programs.

The final step is to choose the hardware on which to run the application. To some extent the alternatives will be restricted by the choice of software. The package supplier will offer guidance, but such advice should not be taken as definitive. Alternatives should be sought.

Again, demonstrations must be arranged, to enable you to compare the products. A similar check-list should be drawn up as for the evaluation of the package, covering the following points:

1. Speed a) Operational.
   b) Response.
2. Upgrading This is the facility for buying and 'latching in' further pieces later. Consider the range of 'add-ons'.
3. Hardware a) Vendor's record.
   b) Reliability.
   c) Maintenance facilities.
4. Relations between hardware and software vendors.

As in the case of software evaluation, take nothing for granted. Ask why, why, why. Ask for and take up reference accounts. It's your money that is being spent, not theirs.

In part six
Robert Moscrop considers some of the problems you may encounter while installing and commissioning the new equipment.

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We won't tell you more about it here, other than to say, it would make very great sense to ensure you see a demonstration of this remarkable program before purchasing a payroll package. It would be highly frustrating to purchase another and then become aware of the PAYROLL 2 excellence afterwards.

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VISICALC 32K/96K RRP £180.00, less £35.00	*£145.00*

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A complete nominal ledger system for accountants

Part 4: Print program

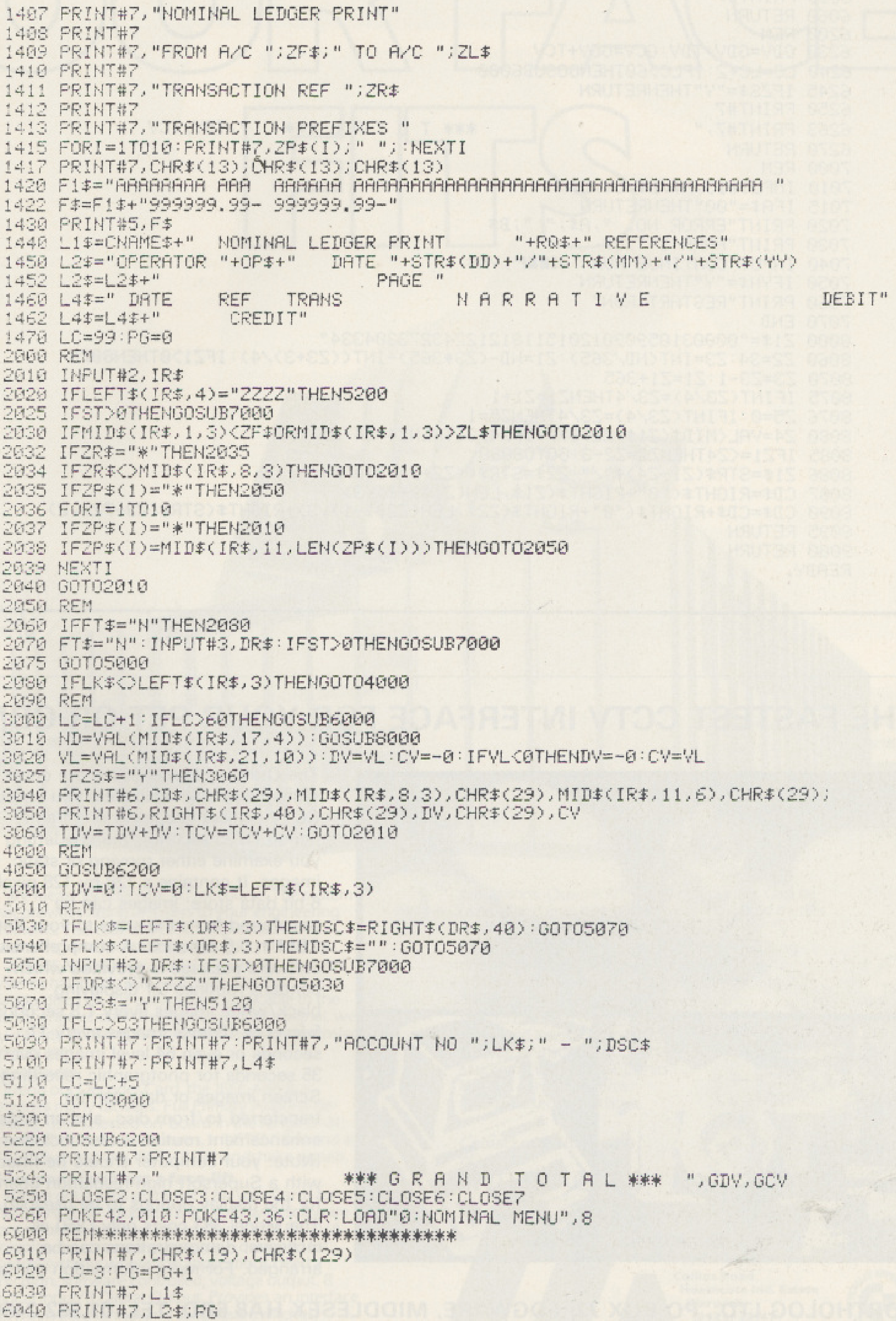
The editors of *Commodore Computing International* have developed a series of computer systems for accountants, for use with the Commodore 4000 with disk drive and printer.

The nominal ledger package contains programs for entry, sort, update, print, amend descriptions and filesort. The first three appeared in the February, March and April issues.

The print program will print reports from the nominal ledger file. The operator is given the option of choosing which transaction references are to be printed, or 'ALL' to print the entire file. For each new nominal code, the description will be obtained from the nominal desc file and printed.

Each selected record will be printed and totals of debits and credits accumulated for printing at the end of the nominal account as well as a grand total at the end of run.

```
500 MD$="312831303130313130313031"
750 DIMZP$(10)
1000 PRINT"⌝  NOMINAL LEDGER PRINT"
1010 PRINT:PRINT:PRINT
1020 INPUT"OPERATOR'S NAME      *▌▓▓▌";OP$
1030 IFOP$="*"THENPRINT"⌝";:GOTO1020
1035 PRINT:PRINT
1040 INPUT"TODAY'S DATE (DDMMYY)   *▌▓▓▌";TD$
1050 IFTD$="*"ORLEN(TD$)<>6THENPRINT"⌝";:GOTO1040
1060 DD=VAL(LEFT$(TD$,2)):MM=VAL(MID$(TD$,3,2)):YY=VAL(RIGHT$(TD$,2))
1070 IFMM<1ORMM>12ORYY<79ORDD<01ORDD>31THENPRINT"⌝";:GOTO1040
1080 REMYR=1900+YY:IFINT(YR/4)=YR/4THENMID$(MD$,3,2)="29"
1090 IFDD>VAL(MID$(MD$,MM*2-1,2))THENPRINT"⌝";:GOTO1040
1100 PRINT"⌶ENTER FIRST AND LAST ACCOUNT NUMBERS"
1110 INPUT"FIRST A/C  000▓▓▓▓▓▌";ZF$
1120 INPUT"LAST  A/C  999▓▓▓▓▓▌";ZL$
1130 INPUT"▓▓TRANSACTION REFERENCE  *▌▓▓▌";ZR$
1132 PRINT"▓"
1135 FORI=1TO10
1140 INPUT"TRANSACTION PREFIX  *▌▓▓▌";ZP$(I)
1142 IFZP$(I)="*"THEN1150
1145 NEXTI
1150 INPUT"▓▓SUPPRESS PRINT  *▌▓▓▌";ZS$
1240 REM**********************************                *OPEN LF 15 AS DISC CMD FILE *
1241 REM*OPEN LF 1 PARAMETER FILE &  *                *READ & STORE CO NAME        *
1242 REM**********************************
1250 OPEN15,8,15
1260 OPEN3,8,3,"1:PARAMETERS,SEQ,READ"
1265 IFST>0THEN7000
1270 INPUT#3,IR$:IFST>0THENGOSUB7000
1280 IFIR$="ZZZZ"THENPRINT"NO COMPANY RECORD ON FILE":END
1290 IFLEFT$(IR$,4)<>"NAME"THEN1270
1310 CNAME$=MID$(IR$,5,30)
1320 CLOSE3
1330 REM**********************************                *OPEN LF 2 - NOMINAL LEDGER  *
1331 REM*OPEN LF 3 - NOM DESCRIPTIONS*                *OPEN LF 4 - PRT. LINE #     *
1332 REM*OPEN LF 5 - PRT. FORMAT      *                *OPEN LF 6 - PRT. USE FORMAT *
1333 REM*OPEN LF 7 - PRT. NO FORMAT   *                ******************************
1340 OPEN2,8,2,"1:NOMINALLEDGER,SEQ,READ":IFST>0THENGOSUB7000
1350 OPEN3,8,3,"1:NOMINALDESC,SEQ,READ":IFST>0THENGOSUB7000
1370 OPEN4,4,3
1380 OPEN5,4,2
1390 OPEN6,4,1
1400 OPEN7,4
1405 PRINT#5,"":PRINT#7,""
1406 PRINT#7
```



```
1407 PRINT#7,"NOMINAL LEDGER PRINT"
1408 PRINT#7
1409 PRINT#7,"FROM A/C ";ZF$;" TO A/C ";ZL$
1410 PRINT#7
1411 PRINT#7,"TRANSACTION REF ";ZR$
1412 PRINT#7
1413 PRINT#7,"TRANSACTION PREFIXES "
1415 FORI=1TO10:PRINT#7,ZP$(I);" ";:NEXTI
1417 PRINT#7,CHR$(13);CHR$(13);CHR$(13)
1420 F1$="AAAAAAAA AAA  AAAAAA AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA "
1422 F$=F1$+"999999.99- 999999.99-"
1430 PRINT#5,F$
1440 L1$=CNAME$+"  NOMINAL LEDGER PRINT      "+RQ$+" REFERENCES"
1450 L2$="OPERATOR "+OP$+"   DATE "+STR$(DD)+"/"+STR$(MM)+"/"+STR$(YY)
1452 L2$=L2$+"                   PAGE "
1460 L4$=" DATE    REF   TRANS          N A R R A T I V E               DEBIT"
1462 L4$=L4$+"      CREDIT"
1470 LC=99:PG=0
2000 REM
2010 INPUT#2,IR$
2020 IFLEFT$(IR$,4)="ZZZZ"THEN5200
2025 IFST>0THENGOSUB7000
2030 IFMID$(IR$,1,3)<ZF$ORMID$(IR$,1,3)>ZL$THENGOTO2010
2032 IFZR$="*"THEN2035
2034 IFZR$<>MID$(IR$,8,3)THENGOTO2010
2035 IFZP$(1)="*"THEN2050
2036 FORI=1TO10
2037 IFZP$(I)="*"THEN2010
2038 IFZP$(I)=MID$(IR$,11,LEN(ZP$(I)))THENGOTO2050
2039 NEXTI
2040 GOTO2010
2050 REM
2060 IFFT$="N"THEN2080
2070 FT$="N":INPUT#3,DR$:IFST>0THENGOSUB7000
2075 GOTO5000
2080 IFLK$<>LEFT$(IR$,3)THENGOTO4000
2090 REM
3000 LC=LC+1:IFLC>60THENGOSUB6000
3010 ND=VAL(MID$(IR$,17,4)):GOSUB8000
3020 VL=VAL(MID$(IR$,21,10)):DV=VL:CV=-0:IFVL<0THENDV=-0:CV=VL
3025 IFZS$="Y"THEN3060
3040 PRINT#6,CD$,CHR$(29),MID$(IR$,8,3),CHR$(29),MID$(IR$,11,6),CHR$(29);
3050 PRINT#6,RIGHT$(IR$,40),CHR$(29),DV,CHR$(29),CV
3060 TDV=TDV+DV:TCV=TCV+CV:GOTO2010
4000 REM
4050 GOSUB6200
5000 TDV=0:TCV=0:LK$=LEFT$(IR$,3)
5010 REM
5030 IFLK$=LEFT$(DR$,3)THENDSC$=RIGHT$(DR$,40):GOTO5070
5040 IFLK$<LEFT$(DR$,3)THENDSC$="":GOTO5070
5050 INPUT#3,DR$:IFST>0THENGOSUB7000
5060 IFDR$<>"ZZZZ"THENGOTO5030
5070 IFZS$="Y"THEN5120
5080 IFLC>53THENGOSUB6000
5090 PRINT#7:PRINT#7:PRINT#7,"ACCOUNT NO ";LK$;" - ";DSC$
5100 PRINT#7:PRINT#7,L4$
5110 LC=LC+5
5120 GOTO3000
5200 REM
5220 GOSUB6200
5222 PRINT#7:PRINT#7
5243 PRINT#7,"                *** G R A N D   T O T A L ***  ",GDV,GCV
5250 CLOSE2:CLOSE3:CLOSE4:CLOSE5:CLOSE6:CLOSE7
5260 POKE42,010:POKE43,36:CLR:LOAD"0:NOMINAL MENU",8
6000 REM*******************************
6010 PRINT#7,CHR$(19),CHR$(129)
6020 LC=3:PG=PG+1
6030 PRINT#7,L1$
6040 PRINT#7,L2$;PG
```

```
6050 PRINT#7
6060 RETURN
6200 REM
6230 GDV=GDV+TDV:GCV=GCV+TCV
6240 LC=LC+2:IFLC>60THENGOSUB6000
6245 IFZS$="Y"THENRETURN
6250 PRINT#7
6263 PRINT#7,"                                 *** T O T A L ***   ",TDV,TCV
6270 RETURN
7000 REM
7010 INPUT#15,A$,B$,C$,D$
7015 IFA$="00"THENRETURN
7020 PRINT"ERROR NO. ",A$;" ";B$
7030 PRINT"PARA 1 ",C$
7040 INPUT"CONTINUE RUN  *███";YN$
7050 IFYN$="Y"THENRETURN
7060 PRINT"RESTART RUN"
7070 END
8000 Z1$="000031059090120151181212243273304334"
8060 Z2=34:Z3=INT(ND/365):Z1=ND-(Z3*365)-INT((Z3+3)/4):IFZ1>0THEN8076
8070 Z3=Z3-1:Z1=Z1+365
8075 IFINT(Z3/4)=Z3/4THENZ1=Z1+1
8076 Z5=0:IFINT(Z3/4)=Z3/4THENZ5=1
8080 Z4=VAL(MID$(Z1$,Z2,3)):IFZ4>31THENZ4=Z4+Z5
8085 IFZ1=<Z4THENZ2=Z2-3:GOTO8080
8086 Z1$=STR$(Z1-Z4)+"/":Z2$=STR$((Z2+2)/3)+"/"
8087 CD$=RIGHT$("0"+RIGHT$(Z1$,LEN(Z1$)-1),3)
8090 CD$=CD$+RIGHT$("0"+RIGHT$(Z2$,LEN(Z2$)-1),3)+RIGHT$(STR$(Z3+72),2)
8095 RETURN
9000 RETURN
READY.
```

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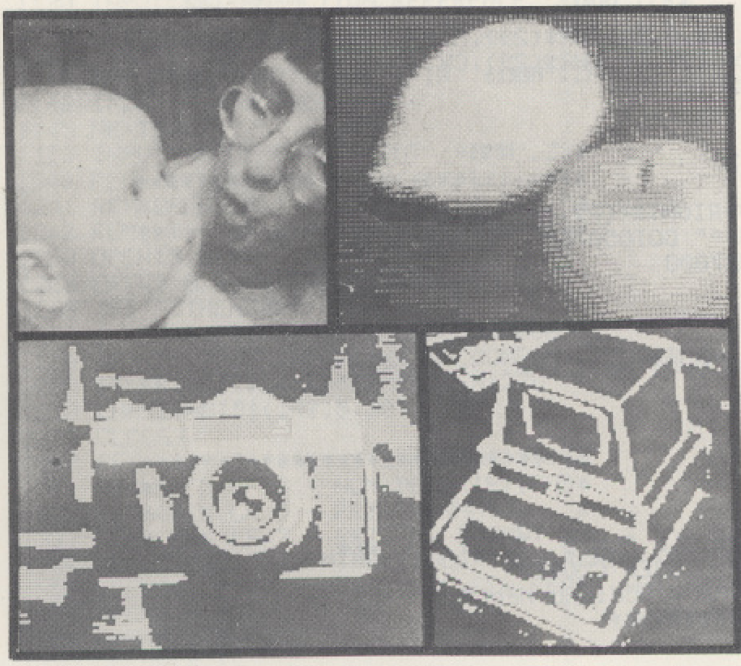

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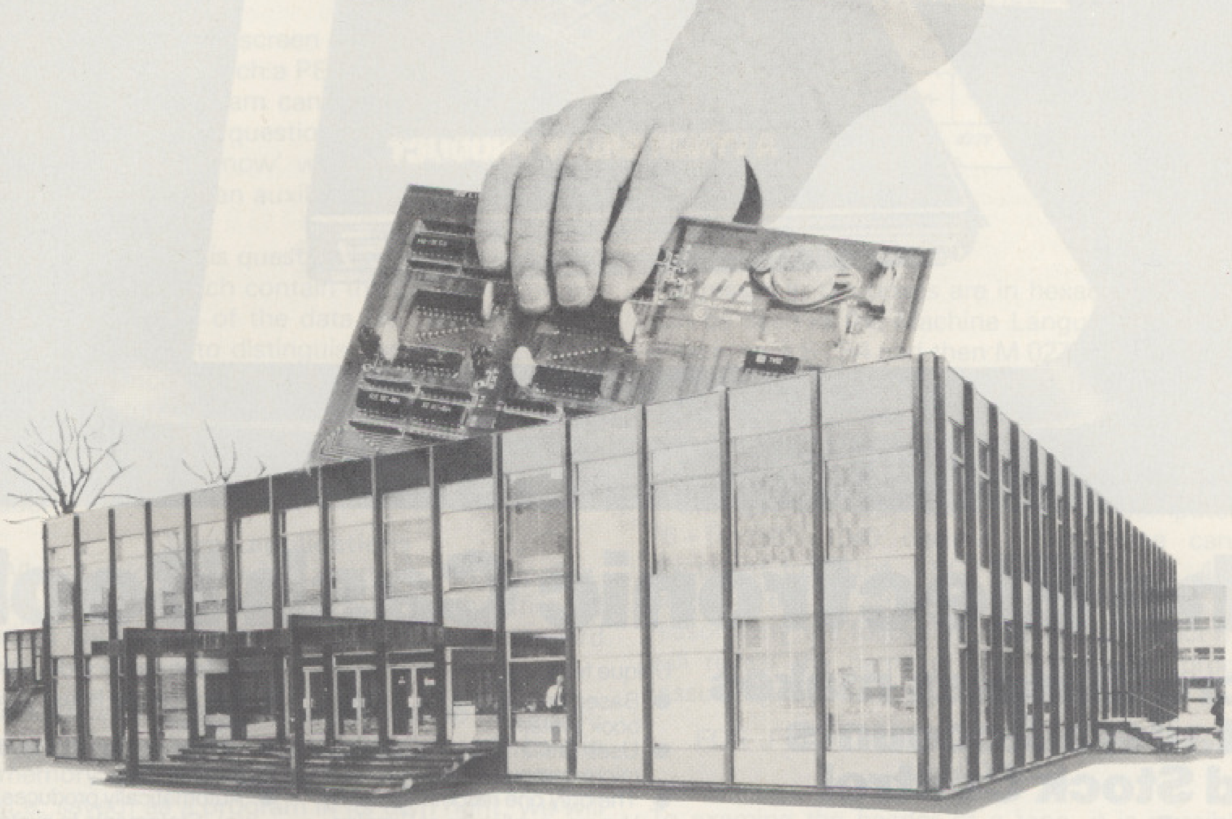

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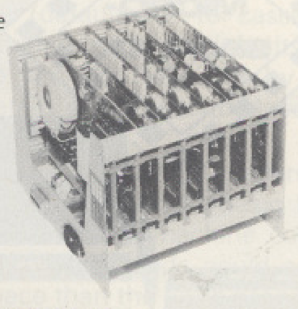

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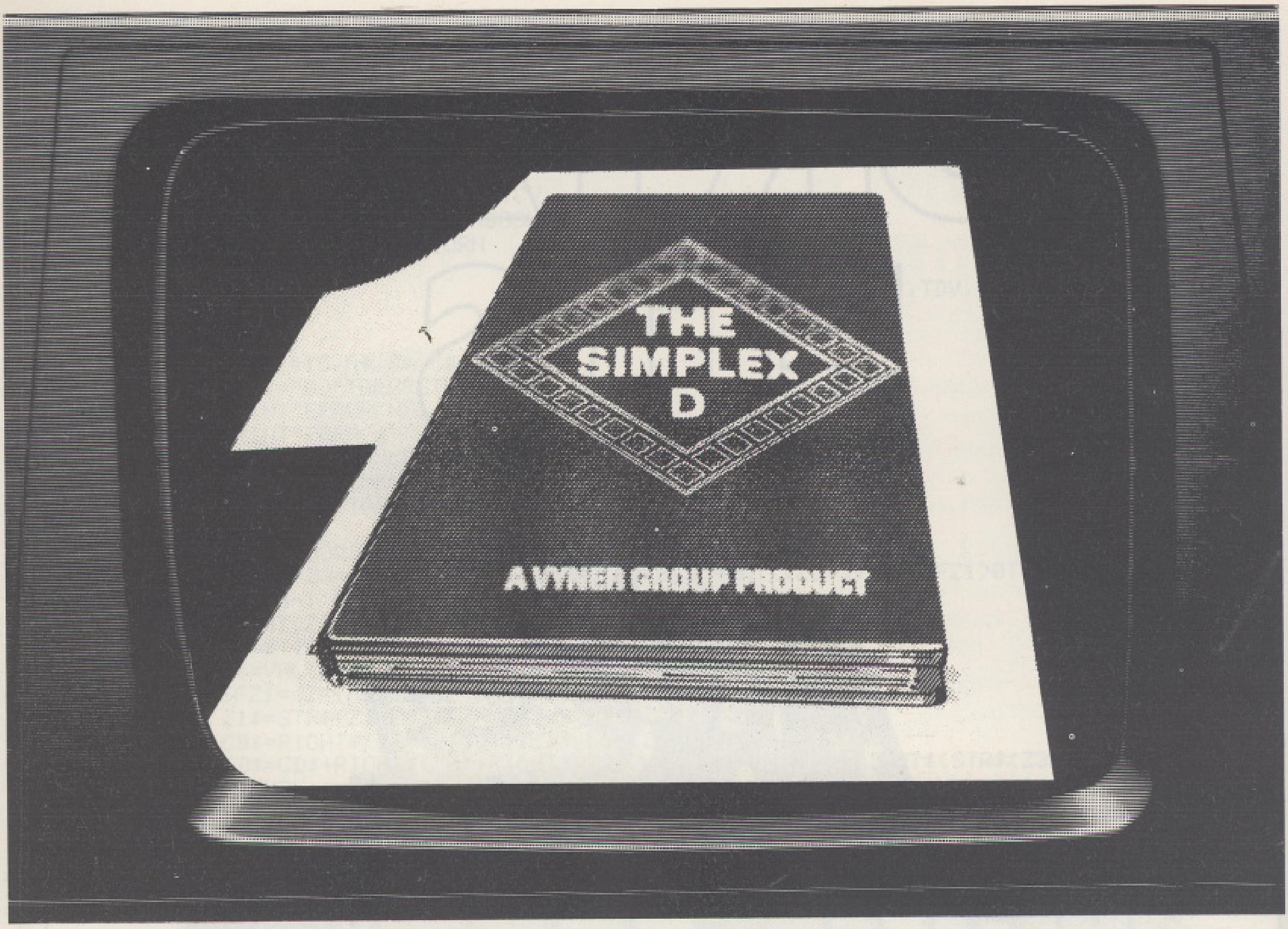

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Use your head(ers)

by M.C. Hart (Leicester Polytechnic)

Advice on how to get the best out of your Commodore PET tape files.

A Basic program or a screen dump of data is essentially a file of data which a PET needs to feed into its RAM before a program can be run or a screen of data displayed. The question arises: how does the operating system 'know' where to place the data that is loaded from an auxiliary device such as tape or disk?

The answer to this question lies in the headers to the file of data which contain the start and end addresses, the name of the data file and other identification markers to distinguish program files from data files. Once an elementary knowledge of the header structure has been obtained, it is possible to modify addresses so that data may be loaded into locations in RAM which differ from those on the header.

Three applications

Why should we need to do this? Three applications will be discussed which illustrate the utility of loading data files or programs in this non-standard way:

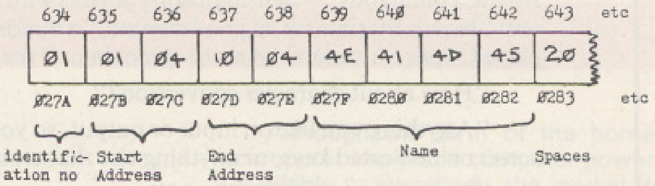
An Append application. If we wish to tag a sub-routine onto the end of a program already held in memory and the sub-routine has been recorded (i.e. saved) as a program in its own right, we will need to specify the start address of the sub-routine as the end address of the program already held in memory so that the two may be 'stitched together'.

An Auto-Start application. The letters RUN and carriage return if loaded into the keyboard buffer, together with information on the number of characters in the keyboard buffer, will automatically run on loading with obvious implications for the protection of programs.

A screen dump application. If a diagram, graph or block of data has been generated on the screen, it is possible to store these in a location below S8000 (32768 decimal) and then save the data file. If, when the data file is read back the header addresses point to the start and end of the screen RAM then an image can be restored to the screen quickly and easily without the need for complex screen-save routines.

Let us examine a tape header which, we will assume, will normally be the header of a program tape that loads into tape buffer 1 (i.e. starting at S027A (634 decimal). This is the tape header from a program such as the following Basic one-liner:

```
10 PRINT ''HELLO''
```


634 635 636 637 638 639 640 641 642 643 etc
01 01 04 10 04 4E 41 4D 45 20
027A 027B 027C 027D 027E 027F 0280 0281 0282 0283 etc
Identific-ation no
Start Address
End Address
Name
Spaces

Addresses in the boxes are in hexadecimal such as can be seen in the Machine Language Monitor (to access type SYS4 and then M 027A-0283). The first of each pair is the low byte and the second is the high byte (= 256 × value). Hence, in the example above, the start address is 1 (low byte) + 4*256 (high byte) which is 1025 decimal (or start of Basic).

Similarly the end address can be computed as 16 + (4*256) = 1040 decimal. The name can be discerned from the ASCII codes (4E, 41, 4D, 45 hex = 78, 65, 77, 69 decimal = NAME). This is the reason why the following statement in direct mode will reveal the name of the last loaded program (assuming tape loading into cassette buffer 1):

```
FOR J=0 TO 15:PRINT CHRS(PEEK(639+J));:NEXT J
```

To examine the header of a tape, it is possible to load the header *only* before the rest of the program with the statement:

```
OPEN 1,1,0 (or more simply) OPEN 1
```

The first parameter is the logical file number, the second the device number (defaults to 1 for cassette 1) and the third the secondary address (defaults to 0). Then a call to the monitor followed by M 027A-029A will reveal details of the recently loaded header.

The first of the applications involving headers is an Append program. This is written in Basic but would not be appreciably faster in machine code; the Basic loader for the machine code could conceivably take up more space than the basic program itself. The line numbers are kept low but away from 0-2 to allow for possible machine code in REM statements in lines 0,1, etc. and also other documenting REMs and/or GOTO jumps into the second program.

I pick up the telephone and immediately recognise the voice of the editor of Commodore Computing International Magazine.

"Hello there John, anything you wish to tell the world about?"

I groan inwardly. A fresh distraction. But then, if you spend your life trying to come up with something new, you have to accept that without guys like him you will be on the dole.

I glance across the room, seeking inspiration from my two companions—Len, the firmware 'magician', is in a trance, doing one of his 'invisible fingers' routines on his long suffering 8000, while Richard glowers over his latest crochet of conductive string and TTL.

How's the KITTEN coming along Len?"

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```
3 FORJ=100TO200STEP10*PRINTJ*NEXT
4 E=PEEK(42)-2+256*PEEK(43):INPUT"APPEND
  NAME   [3cl]";A$:IFASC(A$)=160THENA$=""
5 OPEN1,1,0,A$:N=PEEK(637)+256*PEEK(628)+
  E-1025:POKE635,EAND255:POKE636,E/256
6 POKE637,NAND255:POKE638,N/256:POKE42,
  PEEK(637):POKE43,PEEK(638):PRINT"[cd]
  LOAD BY[cd]"
7 PRINT"[rvs]BASIC4[off] SYS62456:SYS
  46262":PRINT"[cd,rvs]BASIC2[off] SYS
  62393:SYS50242":END
```

Explanation of Append program

Line 3 A one line program to provide a 'body' to which another program can be appended.

Line 4 The variable E computes the location of the start address of the second program. As a Basic program ends with three zero bytes and the end of Basic program pointers (in locations 42 and 43 decimal) point to the byte *after* the three zero bytes, this address is equivalent to end of Basic program minus two.

Notice also the device to circumvent the dropping into direct mode if a null response is given to INPUT. This is three *shifted* spaces followed by three cursor *lefts* which ensures that AS is left with a shifted space (=ASCII 160) if return only is pressed. This can be used if the sub-routine which is to be appended is at a known position on the tape: otherwise the name can be specified and will be searched for specifically by the OPEN 1,1,0,AS command.

Line 5 Searches for the named or next header. When found, the variable N computes the new end address for the load and pokes the low and high bytes of the new load start address into the header.

Line 6 Pokes the low and high bytes of the new end address into the header and also into the 'end of basic' pointers in case an additional Append or Save needs to be performed.

Line 7 Prints out the location of two SYS calls, the first of which completes the load (assuming that the tape play button is still depressed) and the second of which rechains the link pointers into a single program.

As with conventional tool-kit Appends, this one assumes that the line numbers of the sub-routine are higher than the existing program as it merely 'tags' the new program onto the end of the existing one. If one keeps sub-routines in the high numbers (e.g. 60000+) then this should not constitute a serious problem. Do *not* omit the END statement.

It is possible to use the essential features of this program in direct mode without having to enter a program into the memory at all. It is also possible to append a sub-routine in about 1½ minutes flat using direct mode statements. It is necessary to abbreviate the commands to the first letter plus the shifted second letter as is common for the Basic tokens but here are the direct mode statements for those who would like to try the same. With a program already loaded into memory then:

(1) OPEN 1,1,0,"PROGRAM NAME" (or OPEN 1 if@ tape is correctly positioned) (NB Leave PLAY button depressed!)
(2) E=PEEK(42)−2+256*PEEK(43):POKE635,
EAND255;POKE636,E/256:
N=PEEK(637)+256*PEEK(638)+E-1025
(3) POKE637,NAND255:POKE638,N/256:
POKE42,PEEK(637):POKE43,
PEEK(638):SYS62456:SYS46262

The last two SYS calls are for Basic IV:replace with SYS62393:SYS50242 for BASIC II).

A simple Auto-Start application

Normally a program will load into the first areas of free RAM i.e. location S0401(1025 decimal) onwards. If, however, we can have the ASCII codes

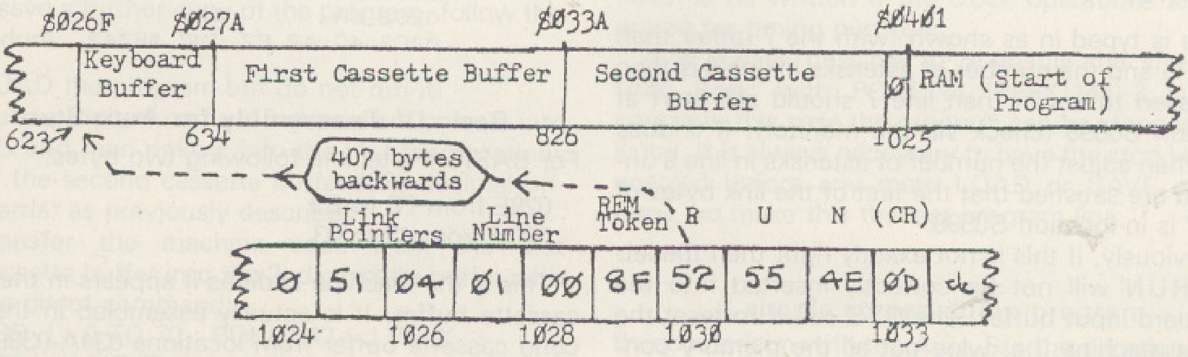

Figure 1: Auto-Start application

for the letters RUN and the carriage return character in a REM statement which is then loaded not into S0401 but into the keyboard buffer, then the program will run automatically upon loading.

The process is not quite as simple as this because the operating system also needs to be told the number of characters in the keyboard buffer and the header pointers themselves need to be changed, but this can all be done with machine code which can be saved along with the program name in the header.

The process is illustrated in figure 1.

What is required is to move the program down in memory so that the contents of memory locations 1030-1033 (letters RUN and carriage return) load 407 bytes lower in memory into locations 623-626. As the start of the Basic program is actually 1025 (not 1030) the program needs to start loading five bytes earlier at location 618 (= S026A).

* * * *

One way to achieve this effect is by typing 5 lines (numbered 1-5) of REM followed by exactly 74 asterisks (or any other character) and a final line 6 of REM and *one* asterisk. Line 7 should now start at S0598 (1432 decimal) which after relocation 407 bytes downwards will now start at location 1025 (decimal). Now poke the hex characters 52, 55, 4E, 0D into locations 1030-1033 so that after relocation they will reside in the keyboard buffer (these are the characters for RUN and carriage return).

However, two further features need to be added. As it stands the program would still load and run normally (which rather defeats the object of an auto-start if one wishes to protect code). Secondly, some machine code needs to be added to change the header pointers, to poke the number of characters into the required location and to enable one to save the program in a non-standard way.

To achieve the first of these features, line 5 could be made into a line such as the following:

```
5 ?"TO LOAD AND RUN THIS PROGRAM,TYPE
'OPEN1:SYS655'":FORJ=1 TO3000:NEXT:
SYS64790
```

If this is typed in as shown (with the ? rather than PRINT) and the number of asterisks in line 6 is then increased to seven then line 7 should still start at location S0598 (check via the monitor). If it does not, then adjust the number of asterisks in line 6 until you are satisfied that the first of the link bytes of line 7 is in location S0598.

Obviously, if this is not exactly right then the letters RUN will not be correctly inserted into the keyboard input buffer. The SYS call is to reset the whole machine (i.e. wipe out all the memory contents) if a normal LOAD and RUN is attempted-replace this with SYS 64721 for Basic II.

Now it is necessary to insert the machine code into the second cassette buffer. A program name can be put into a variable AS and then poked into the top of the second cassette buffer with the statement:

```
FOR J=0 TO LEN(AS)-1: POKE 826+J,ASC
      (MIDS(AS,J+1)):NEXT
```

Then, via the monitor, poke the following machine code into the second cassette buffer:

```
034A  A9  6A  8D  7B  02  A9  02  8D
0352  7C  02  A9  04  85  9E  4C  F8
035A  F3  A9  01  85  FB  A9  04  85
0362  FC  A5  2A  85  C9  A5  2B  85
036A  CA  A9  01  85  D4  A9  47  85
0372  D1  A9  3A  85  DA  A9  03  85
037A  DB  A2  01  CA  4C  42  F7
```

This hex dump is for Basic IV. For Basic II alter the following two bytes:

0359 from F8 to B9
037F from 42 to 03

```
028F A9 6A    LDA #$6A
0291 8D 7B 02 STA $027B
0294 A9 02    LDA #$02
0296 8D 7C 02 STA $027C
0299 A9 04    LDA #$04
029B 85 9E    STA $9E
029D 4C F8 F3 JMP $F3F8
02A0 A9 01    LDA #$01
02A2 85 FB    STA $FB
02A4 A9 04    LDA #$04
02A6 85 FC    STA $FC
02A8 A5 2A    LDA $2A
02AA 85 C9    STA $C9
02AC A5 2B    LDA $2B
02AE 85 CA    STA $CA
02BC A9 01    LDA #$01
02B2 85 D4    STA $D4
02B4 A9 47    LDA #$47
02B6 85 D1    STA $D1
02B8 A9 3A    LDA #$3A
02BA 85 DA    STA $DA
02BC A9 03    LDA #$03
02BE 85 DB    STA $DB
02C0 A2 01    LDX #$01
02C2 CA       DEX
02C3 4C 42 F7 JMP $F742
```

Basic IV disassembly for Auto-Start

For BASIC II alter the following two bytes:

029E from F8 to B9
02C4 from 42 to 03

This is the machine code as it appears in the first cassette buffer. It is actually assembled in the second cassette buffer from locations 034A-0380 but is automatically transferred to the first cassette in a non-standard way by a call to SYS859.

Locations 028F-029F alter the header pointers, store the number of characters in the keyboard input buffer and jump to a ROM routine for loading the rest of the program minus header.

Locations 02A0-02C5 set the various parameters necessary for the non-standard save in order to preserve machine code in the first cassette buffer.

```
  PC   IRQ  SR AC XR YR SP
 B780 E455 2C 34 3A 9D F8

 034A A9 6A 8D 7B 02 A9 02 8D
 0352 7C 02 A9 04 85 9E 4C F8
 035A F3 A9 01 85 FB A9 04 85
 0362 FC A5 2A 85 C9 A5 2B 85
 036A CA A9 01 85 D4 A9 47 85
 0372 D1 A9 3A 85 DA A9 03 85
 037A DB A2 01 CA 4C 42 F7 20
```

This hex dump is for Basic IV. For Basic II alter the following two bytes:

0359 from F8 to B9
037F from 42 to 03

This machine code, as well as altering the header pointers and achieving the load of the remainder of the program (S034A-S035A), sets the parameters for a non-standard SAVE of the program, incidentally transferring itself to the first cassette buffer where it is saved in the header along with the program name. A non-standard SAVE is necessary because in the ordinary course of events a SAVE routine will overwrite the contents of the first cassette buffer, leaving behind details of the header start and end addresses and the program name.

If all has gone well so far a normal LOAD followed by RUN will result in a message displaying the fact that the program requires an

OPEN1:SYS655

in order to load and run, followed by a resetting of the machine. When OPEN1:SYS655 is followed then the PET will locate the header, change the start address and auto-run without further ado.

To save a further copy of the program, follow this procedure:

(1) LOAD the program but do not run it!
(2) Put a program name (16 characters or less) into AS and then poke it into the first few locations of the second cassette buffer (826 decimal onwards) as previously described.
(3) Transfer the machine code from the first cassette buffer into the 2nd cassette buffer with the direct command:
FOR J=0 TO 70 : POKE 842+J,PEEK (655+J):NEXT J
(4) TYPE SYS859

When the SYS call is activated, you will get a PRESS PLAY & RECORD message, which, when performed, will write on the screen the program name followed by a strange collection of graphic symbols as the machine code in the header is interpreted as ASCII characters! This is quite normal and will not reappear when the program is loaded.

This particular AUTO-RUN is rather crude and needs further code to prevent unauthorised access, e.g. all INPUT statements need protecting against a null return by three shifted spaces and cursor lefts as described under Append and the STOP key needs disabling by POKE144, PEEK(144)+3. Finally, there should only be one exit point (simply good programming practice!) which should give the opportunity to run the program again or else reset the machine.

More difficult

The technique is crude because resetting the start of BASIC pointers can circumvent the AUTO-RUN but life can be made more difficult for the would-be 'code-cracker' by including a few REMS with characters in them that prevent listing (e.g. SDB for BASIC IV or SCC for BASIC II). These are the shifted left square bracket and shifted L respectively and can act as a deterrent against unauthorised listing.

The operation of disabling the stop key in machine code cannot be done before the tape load as the IRQ vectors are reset by tape load operations and afterwards if the program is run both of the tape buffers are overwritten. A way round, though, can be found by making the first line of the program (i.e. line 7) a REM statement with seven (or more) asterisks and then poking the locations 059D-05A3 with the hex values A5,90,69,03,85,90,60 and then calling this code by a SYS 1030 in line 8 (i.e. first operative line) of the newly loaded program.

This has the advantage also of making the stop key disable somewhat more opaque and covers both Basic II and IV. Notice that this stop key disable also turns off the clock; more sophisticated code will need to be written if the clock operations are required for timing purposes.

It is always possible to re-enable the stop key from Basic with POKE144, PEEK(144)-3 but of course in this case the program can be stopped and listed. It is always necessary to have the stop key re-enabled before any more LOAD or SAVE operations, so make this the last program line.

A simple screen dump program

By comparison with the Auto-Start application, this program is simplicity itself. The operating system will not allow a save beyond S8000 (S8000-S83FF

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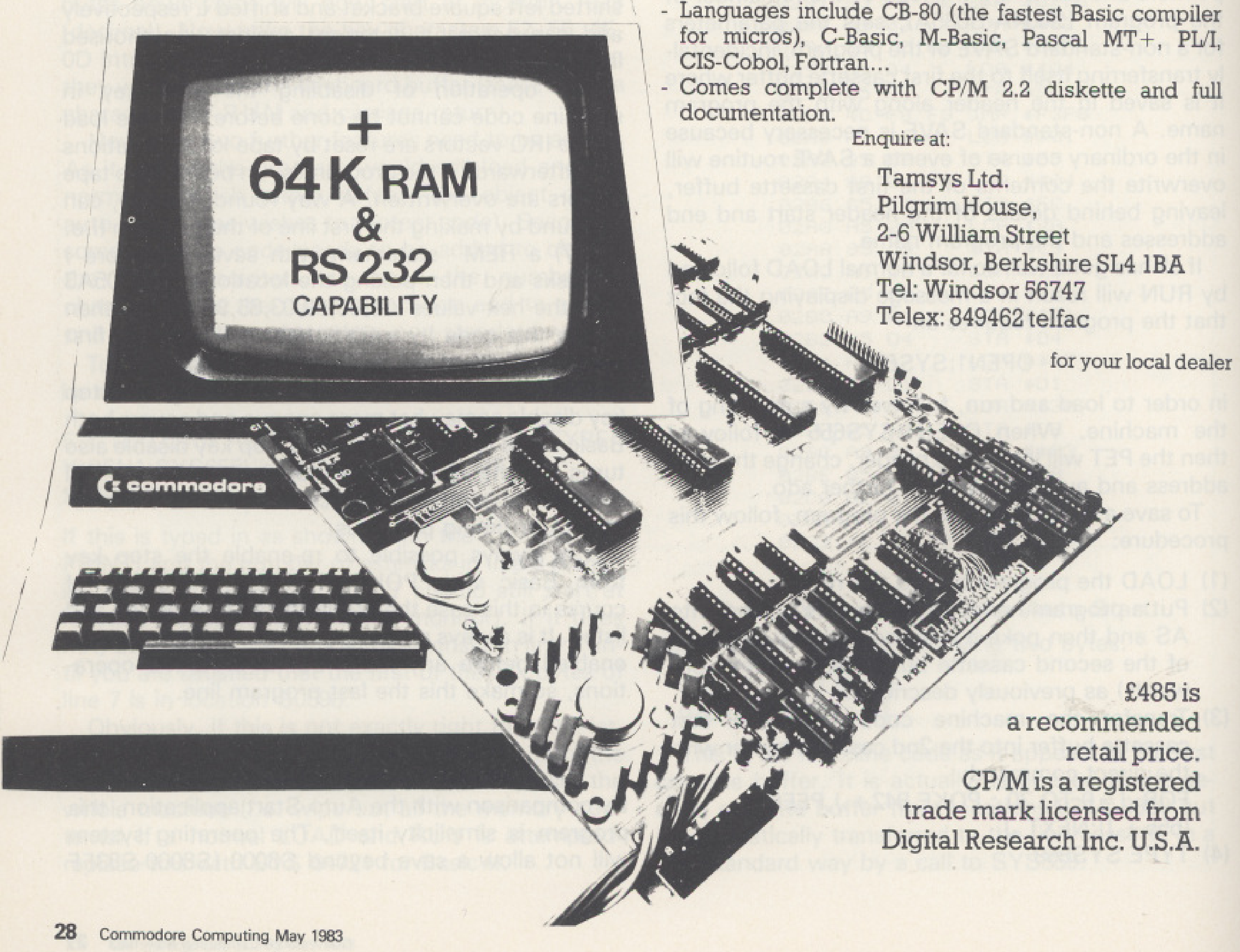

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are the screen RAM locations), so to save a screen image we transfer the contents of screen RAM to an area below S8000 and then save this via the monitor. Then to load back onto the screen all we need to do is alter the header addresses to load back into the screen.

Assuming the smallest size of PET (i.e. 8K of RAM) then on power-on the top of memory pointer will contain a value of 32. Poking location 53 decimal with 28 will lower the top of memory to 7168 decimal leaving space free for our screen-save file.

Graphic

Now load any program into the PET but preferably one with an interesting graphic display such as a chart or diagram. In the absence of anything immediately suitable try:

```
FOR J= 161 TO 224 : PRINT J:CHRS(J);:NEXT J
```

Now locate the cursor on the bottom line of the screen and type on one line (assuming some abbreviations):

```
FOR J=0 TO 959 : POKE 7168+J,PEEK
   (32768+J):NEXT
```

This will take about 15 seconds while the contents of the first 24 lines are read into the space above the top of memory. Now enter the monitor by SYS 4 and save the file just created by using the command:

```
.S "SCREEN-DUMP",01,1C00,1FC0
```

Reposition the tape and load in the header of the Screen-Dump file by OPEN 1. Type SYS4 to break into the monitor and then M 027A-027A to read (and then alter) the header details.

The monitor will show the following:

```
027A 01   00 1C    C0 1F    53  43  52
          ______   ______
          Start     End     S   C   R   etc.
         Address  Address
```

Now with the cursor alter the start address to 00 80 and the end address to 98 83 and then complete the load into screen RAM by a SYS 62456 (Basic IV) or SYS 62393 (Basic II).

Shorthand

As with the other programs detailed in this article, these SYS calls assume that the play button on the recorder is still depressed. A shorthand way of doing this without entering the monitor is to POKE 636,128 : POKE 638,132 before entering the SYS call.

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Educating the business user

Title : *Choosing and using a Business Microcomputer,*
Author : *Bradbeer, Allason, Miles and Webb,*
Price : *£12.50*
Publisher : *Gower Publishing Co. Ltd.,*
Address : *Gower House, Croft Road, Aldershot,*
Hants. GU11 3HR
Tel : *Aldershot 331551.*

You might have heard of one or two of the co-authors : Robin Bradbeer, Julian Allason, Barry Miles and Robert Webb. All four are respected names in the business computer world and well qualified to tackle the subject.

The 'four wise men' have done their job well. Other books of a similar nature have appeared over the last couple of years, but this would seem to be the best of the bunch. Arguments are presented with interest, and not without humour, there are numerous diagrams and photographs (although these could be captioned : where did you get that PET on page 50 ?!), and the book as a whole makes 'a good read'.

We start off with an introduction to microcomputers, how they work and how they do what they do. Planning for a Microcomputer, the second chapter, goes more deeply into the question of what you ought to look for in a micro, and some simple rules to follow when you do get one. Should your staff be allowed to play Space Invaders, and how to look after floppy disks, are just two of the diverse (but commonly encountered) topics covered here.

Choosing Your Software

The book progresses logically to the subject of choosing your software, and describes a number of criteria that must be satisfied before parting with that most valuable of assets, money. Maintenance, ease of use, reliability, are all areas that should be examined in detail, and all of these, and more, are covered.

Finally, choosing your system, with a round-up of what is available. Beware, though : this section of the book is not completely up to date. For instance, the Commodore 8050 disk drive is not new, Apple produce rather a lot more than the Apple II, and so on. Still, within these confines, the advice presented is useable and valuable.

Four case studies, useful if you fall into the categories described, but otherwise a waste of space, lead into a series of appendices on manufacturers and suppliers, independent sources of software and hardware, and a glossary of useful terms.

If you are thinking of buying a microcomputer for business use then this book is well worth reading. For mere background knowledge of the subject area, it is a good reference guide. And to while away a few hours, Choosing and Using A Business Microcomputer is a humorous and interesting read.

VIC-20 for beginners

Title : *Learning to Use the Vic-20 Computer*
Author : *Ron Geere*
Price : *£6.45*
Publishers : *Gower Publishing Company Ltd.*
Address : *Lower House, Croft Road, Aldershot,*
Hants. GU11

In our October 1982 issue we published a review of a book by Garry Marshall, called *Learning to use your PET computer.* This, as you might imagine, is a follow-on from that early work, but with a different author.

Our review of the PET book concluded that this was a fairly good idea, unfortunately not well implemented. We hoped for better things from other books in the proposed series. We are, however, presented with the same mixture as before, starting with an introduction to the Vic, a chapter on Using the Vic, and one on an Introduction to Programming. These are so banal as to (almost) defy belief. Why, in a book that is only 76 pages long, devote half a page to showing a screen display of what happens when you save and verify a program on tape ? This, incidentally, follows similar displays on what happens when you load a program!

A number of diagrams, each taking up half a page or more, concentrate on flow charting the simplest of programs : adding two numbers together and guessing at the results, defining three string variables and showing the outcome of adding them together in three different orders.

The chapter on graphics follows a similar vein. Considering the number of pages we have at our disposal, needless space is wasted in inane diagrams and pictures.

Why, given such a good idea (an intermediate step between the original manual and the Programmers Reference Manual), does the end result have to be a book that tells you nothing that you don't already know ? Oh well, there's always the Commodore 64.

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AUTO	40	Provides automatic line numbering.
BEEP	60	Plays music of given duration and pitch.
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BSAVE	120	Saves the memory area between two given addresses.
CALL	80	Enter a machine-code subroutine with given Acc,X- & Y-reg.
CIF,CEND ELIF,ELSE	220	Four commands which provide facilities for structured BASIC, largely eliminating the need for the GOTO command.
CURSOR	30	Places the cursor at position x,y on the screen.
DATIN	690	Foolproof input routine for dates with full error detection.
DELETE	70	Deletes a given range of program lines.
DISABLE	50	Disables the run/stop key without affecting the internal clock.
DISP	140	Displays a prompting or warning message on a given line.
DREAD	100	Reads data from disk without input restrictions.
DSEARCH	330	Searches a disk relative-file for a given string or pattern.
DUMP	170	Outputs the names and values of all current scalar variables.
EDIT	70	Adds 'delete-forwards' function.
EXEC	140	Executes a string as a BASIC command.
FIND	200	Lists all lines in which a given character string appears.
GENIN	700	General foolproof input routine with selected key disablement.
GSUB	110	Performs a GOSUB to a given labelled line.
GTO	90	Performs a GOTO as above.
INPUT	40	Allows a program to continue despite a null entry being input.
INVERT	160	Turns a string back to front.
IRQ	60	Restores normal system use of interrupts.
KILL	20	Takes out SOFTCHIP commands.
LINES	50	Calculates the number of lines in a program.
LWIND	170	Loads a screen display from a compressed format file.
MERGE	360	Merges a program from tape or disk into the current program.
MON	10	Enters the CBM machine-code monitor.
MOVE	130	Moves a block of memory to another position in RAM.
NUMIN	740	Foolproof input routine for amounts of money.
PCTRL	100	Set the device number and characteristics of the printer.
PLOT	170	Plots a double-density point on the screen.
POP	30	Removes the last subroutine return address from the stack.
PRINT	130	Adds routine to automatically right-justify amounts of money.
PRINT	280	Modifies all printer-output as needed and adds TAB function.
PUSH	60	Pushes a return address onto the stack.
RENU	930	Renumbers a program, altering all GOTO's, THEN's, etc.
REPEAT	50	Adds repeat key function.
REPLACE	490	Replace all occurrences of one character string with another.
RESCUE	40	Recovers a program accidentally 'NEW'ed.
RESET	170	Resets a double-density point on the screen.
RESTORE	20	Restores DATA back to a given line number.
REVERSE	50	Reverses the field of the screen.
SCAN	190	Scans a string for the next occurrence of a given character.
SCOPY	340	Copies the screen to the printer.
SCROLL	230	Scrolls screen contents up,down, left or right.
SEARCH	270	Searches an array for a given string or pattern.
SHRINK	180	Removes all unnecessary spaces and 'REM's from a program.
SORT	760	Sorts any one-dimensional array (and tags another array along)
SWAP	440	Loads in another program, retaining all variables.
SWIND	150	Saves the contents of the screen in a compressed format.
TRACE	110	Displays the last six line numbers at the top-right screen.
VAR	390	Outputs the names of all variables referred to in a program.
WINDOW	30	Sets top, bottom, left, right for an 8032 screen window.
WPOKE	50	Pokes two memory locations in hi-lo 6502 order.

★ ★ NEW COMMANDS NOW AVAILABLE

BORDER	100	Draws a border around the edge of the screen
CLOCK	250	Continually displays the time at a given screen position.
GRAPH	20	Gives access to the box-drawing characters on an 8032
ON	50	Branches to program line corresponding to key pressed.
PROTECT	90	Allows regain of control after system crash.
STATS	120	Outputs the number of statements in the current program.

★ ★ NEW FUNCTIONS which may be used in any expression

AVG	140	Calculates the average of the elements in a numeric array.
BLANK	40	Tests a string : returns true if the string is blank.
DEC	80	Gives the decimal equivalent of a hexadecimal number.
FACT	60	Provides the factorial function.
GAMMA	90	Provides the gamma function.
HEX$	90	Gives the hexadecimal equivalent of a decimal number.
MAX	120	Returns the maximal element of an array.
MIN	120	Returns the minimal element of an array.
NORM	160	Provides the normal distribution area function.
PAD$	90	Pads a string with spaces.
QUME$	70	Assists high-resolution plotting on QUME Sprint 5 printer.
SHR$	260	Gives the compressed form of a number for compact storage.
SPC$	30	Gives a string of spaces of given length.
SUM	130	Returns the sum of elements of an array.
WPEEK	40	Peeks a two-byte address.
XPD	220	Decompresses a number.

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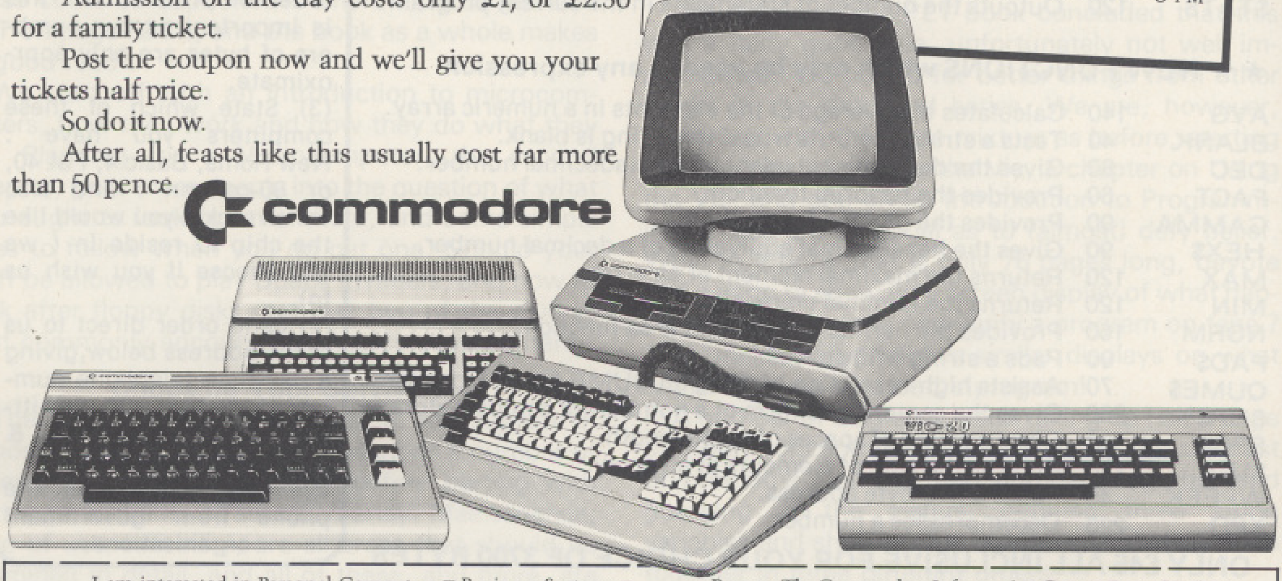

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Locksmith

By Peter Gabor

This will work on any Basic 4.0 PET and requires a disk drive to be connected and switched on before running.

It is a way of protecting a normal Basic program from prying eyes. When run, the program merges a machine code routine to the start of your program, then saves the whole lot onto disk again.

Subsequent loading of your original program will show you that the program now runs automatically on loading, and the stop key has been disabled.

```
100 REM **********************************
110 REM *        L O C K S M I T H       *
120 REM *             10/10/82           *
130 REM * MERGES LOCKSMITH SEQUENCE      *
140 REM * TO BASIC PROGRAM.              *
150 REM *       I M P O R T A N T        *
160 REM * COLD START THE 'PET' BEFORE*
170 REM * USING LOCKSMITH!               *
180 REM **********************************
190
200 LNE$="______________________________"
210 PRINT"■"TAB(8);LNE$:PRINTTAB(8)"■ * L O C K S M I T H * "
215 S1=2240: S2=2100
220 INPUT"■■■NAME OF PROGRAM   ■■■";FL$
250 OPEN5,8,5,FL$+",P,R"
252 IF DS>19 THEN  PRINT"■■■■";: DCLOSE: GOTO220
254 SYS S1
256 OPEN5,8,5,FL$+",P,R"
260 INPUT"■PRG TO DRIVE #   0■■■";D2$
270 IF D2$<>"0" AND D2$<>"1" THEN PRINT"■■■":GOTO260
280 GOSUB405: FO$=LEFT$(FL$,13)+".AU"
290 OPEN6,8,6,D2$+":"+FO$+",P,W"
300 GOSUB410: PRINT"■■"LEFT$(LNE$,LEN(FL$))
340 PRINT"■"FL$"■ IS NOW BEING CONVERTED
350 PRINT"■TO RUN AUTOMATICALLY ON "CHR$(34)"LOAD"CHR$(34)
360 PRINT"■"TAB(20)LEFT$(LNE$,LEN(FO$))
370 PRINT"NEW PROGRAM NAME:    ■"FO$
380 SYS S2
390 CLOSE5:CLOSE6:PRINT"__________________"
395 PRINT"■ANOTHER RUN?■ (Y/N)"
396 GETA$: IF A$<>"Y" AND A$<>"N" THEN 396
397 IF A$="Y" THEN RUN
400 END
405 OPEN15,8,15
410 INPUT#15,A,A$:IFA=0THENRETURN
420 PRINT"■"A$: DCLOSE: END
425 REM * * * * * * * * * **
READY.
```

```
0834 A9 00 A2 06 20 C9 FF 20
083C D2 FF A9 01 20 D2 FF A9
0844 02 A2 FF 20 D2 FF CA D0
084C FA BD F3 08 C9 EE F0 06
0854 20 D2 FF E8 D0 F3 A9 00
085C CA 20 D2 FF E8 D0 FA BD
0864 00 03 20 D2 FF E8 D0 F7
086C A9 00 20 D2 FF A2 05 20
0874 C6 FF 20 E4 FF 20 E4 FF
087C A0 00 A2 05 20 C6 FF 20
0884 E4 FF 99 00 0A A6 96 D0
088C 20 C8 C0 FF D0 F1 86 21
0894 A2 06 20 C9 FF A2 00 BD
089C 00 0A 20 D2 FF E8 88 D0
08A4 F6 A4 21 F0 D5 20 CC FF
08AC 60 8A C8 29 40 F0 02 D0
08B4 DD 20 07 DA A0 90 4C AF
08BC F5 8A C8 29 A2 05 20 C6
08C4 FF 20 E4 FF C9 01 D0 E9
08CC 20 E4 FF C9 04 D0 E2 8D
08D4 4D 09 A0 01 C8 D0 03 EE
08DC 4D 09 20 E4 FF A5 96 F0
08E4 F3 29 40 F0 CC 8C 4C 09
08EC 20 CC FF 20 07 DA 60 02
08F4 00 00 00 A9 16 85 94 A9
08FC FD 85 95 A5 90 A4 91 C0
0904 B0 10 03 4C 16 FD 18 69
090C 03 90 01 C8 8D 82 02 8C
0914 83 02 A2 12 BD 50 02 9D
091C 6F 02 CA 10 F7 9A A9 01
0924 48 48 48 48 48 A9 7A A0
092C 02 78 85 90 84 91 58 A9
0934 05 85 9E AD 77 02 85 2A
093C AD 78 02 85 2B 4C FF B3
0944 93 52 55 4E 0D 00 00 00
094C 9A 04 00 20 EA FF A9 FF
0954 85 9B 4C EE 4C EE 4E 0D
095C 00 00 00 00 00 00 20 EA
0964 FF A9 FF 85 9B 4C FC FF
096C EE AA AA AA 4B 48 00 00
READY.
```

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Unlock

By Peter Gabor

This performs the reverse function of Locksmith, in that it removes the machine code routine at the start of the program. Obviously, if you're going to using Locksmith on your own programming, keep the rest of the magazine away from those same prying eyes!

```
07D0 A2 05 20 C6 FF 20 E4 FF
07D8 85 21 20 E4 FF 85 22 C9
07E0 04 F0 04 B0 67 90 08 A5
07E8 21 C9 02 90 0F B0 5D 20
07F0 E4 FF E6 21 D0 F9 E6 22
07F8 A5 22 D0 E3 A5 21 C9 01
0800 F0 03 20 E4 FF A2 06 20
0808 C9 FF A9 01 20 D2 FF A9
0810 04 20 D2 FF A0 00 A2 05
0818 20 C6 FF 20 E4 FF 99 00
0820 0A A6 96 D0 1F C8 C0 FF
0828 D0 F1 86 21 A2 06 20 C9
0830 FF A2 00 BD 00 0A 20 D2
0838 FF E8 88 D0 F6 A4 21 F0
0840 D3 4C CC FF 8A C8 29 40
0848 F0 02 D0 DE 20 07 DA A0
0850 90 4C AF F5 94 FF FF FF
0858 47 4A 00 00 00 00 00 AA
READY.
```

```
 100 REM ********************************
 110 REM *          U N L O C K         *
 120 REM *            1/10/82           *
 130 REM * REMOVES MC PART FROM START *
 140 REM * OF BASIC PROGRAM.            *
 180 REM ********************************
 190 :
 200 POKE42,088:POKE43,8:CLR:LNE$="____________________"
 210 PRINT"▒"TAB(10);LNE$:PRINTTAB(10)"▒ * U N L O C K * "
 220 INPUT"▒▒NAME OF PROGRAM   ███";FL$
 230 INPUT"    ON DRIVE #   0███";D1$
 240 IFD1$<>"0"AND D1$<>"1" THEN PRINT"TT": GOTO230
 250 OPEN5,8,5,D1$+":"+FL$+",P,R"
 260 INPUT"▒PRG TO DRIVE #   0███";D2$
 270 IF D2$<>"0" AND D2$<>"1" THEN PRINT"TTT":GOTO260
 275 GOSUB410: A$=RIGHT$(FL$,3)
 280 IF A$=".AR" OR A$=".AU" THEN FO$=LEFT$(FL$,LEN(FL$)-3): GOTO290
 285 INPUT"▒NAME OF NEW PROGRAM   ███";FO$
 290 OPEN6,8,6,D2$+":"+FO$+",P,W"
 300 PRINT"▒▒THE MC PART AT THE START OF"
 310 PRINTLEFT$(LNE$,LEN(FL$))
 340 PRINT"▒"FL$"▒ IS NOW BEING REMOVED."
 360 PRINT"▒"TAB(20)LEFT$(LNE$,LEN(FO$))
 370 PRINT"NEW PROGRAM NAME:    ▒"FO$
 380 SYS  2000
 390 CLOSE5:CLOSE6
 400 END
 410 IF DS<20 THEN RETURN
 420 PRINT"▒"DS$: DCLOSE: END
 425 REM * * * * * * * * * * * * * * * * * * * * * * *
 430 REM * * * * * * * * * * * * * *
READY.
```

Grapher

By Steven Darnold

Grapher is a program for any 40 column PET. Its purpose is to plot out a function on the screen using quarter square graphics. The first time you run the program you'll be seeing a plot of the function SIN (X)1, as a demonstration, but in future runs the routine in lines 50 to 65 allows you to plot any function you like.

After seeing the result you have a number of options, which are outlined in lines 9510 to 9560.

A useful program that makes good use of the graphics character set on the PET.

```
40 POKE59468,12:A$="SIN(X)+1":GOTO85
50 PRINT"□▒WHAT FUNCTION DO YOU WANT GRAPHED?
52 PRINT:PRINT"(PLEASE USE 'X' AS THE VARIABLE)":PRINT"▶▶▶▶▶◀◀◀";
53 INPUTA$
60 PRINT"□▒▒90DEFFNA(X)="A$
62 PRINT"A$=";CHR$(34);A$;CHR$(34);":GOTO85
65 POKE158,2:POKE623,13:POKE624,13:PRINT"▒";:END
85 PRINT"□
90 DEFFNA(X)=SIN(X)+1
100 PRINT"WHAT IS LARGEST VALUE OF X TO BE
110 PRINT"▒GRAPHED";
120 INPUTX
125 PRINT"□
130 Y=0
140 FORI=0TOXSTEP.01*X
150 S=FNA(I)
160 IFS>YTHENY=INT(S+.9)
170 NEXT
180 FORI=0TO37
190 POKE33729+I,99
200 NEXT
205 POKE33738,80:POKE33748,80:POKE33758,80
210 FORI=0TO23
220 POKE32808+40*I,103
230 NEXT
232 POKE32968,122:POKE33208,122:POKE33448,122
240 Y$=STR$(Y)
245 Y$=RIGHT$(Y$,LEN(Y$)-1)
320 POKE33728,48
400 FORI=1TO79STEP2
405 KK=33728+(I+1)/2
410 IFI=79THEN5000
420 Y1=INT(FNA(X/78*I)*48/Y+.5)
430 Y2=INT(FNA(X/78*(I+1))*48/Y+.5)
440 IFY1=Y2GOTO2000
450 IFABS(Y1-Y2)=1GOTO3000
1000 H=INT(.5*Y1+.5):IFH<0THEN1100
1010 IFH=.5*Y1THENPOKEKK-40*H,126
1020 IFH<>.5*Y1THENPOKEKK-40*H,123
1100 H=INT(.5*Y2+.5):IFH<0THENNEXT
1110 IFH=.5*Y2THEN POKEKK-40*H,124
1120 IFH<>.5*Y2THEN POKEKK-40*H,108
1130 NEXT
2000 H=INT(.5*Y1+.5):IFH<0THEN NEXT
2100 IFH=.5*Y1THENPOKEKK-40*H,226:NEXT
2200 POKEKK-40*H,98 :NEXT


3000 H=INT(.5*Y1+.5)
3100 IFY1>Y2ANDY1*.5<>HTHEN1000
3200 IFY1<Y2ANDY1*.5=HTHEN1000
3300 IFY1<-1THEN NEXT
3400 IFY1>Y2THENPOKEKK-40*H,127:NEXT
3500 POKEKK-40*H,255:NEXT
5000 PRINT"▒"Y$
5260 X3=INT(X/100)
```

```
5270 X2=INT(X/10-10*X3)
5280 X1=X-10*X2-100*X3
5290 IFX3>0THENPOKE33765,X3+48
5300 IFX2>0ORX3>0THENPOKE33766,X2+48
5310 POKE33767,X1+48
5500 PRINT"▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒";
5505 J=0
5507 IFJ=588THENJ=197:GOTO5600
5510 FORI=33094+JTO33097+J+LEN(A$)
5520 IFPEEK(I)<>32THENPRINT"▒▒▒";:J=J+42:GOTO5507
5522 IFPEEK(I-40)<>32THENPRINT"▒▒▒";:J=J+42:GOTO5507
5524 IFPEEK(I+40)<>32THENPRINT"▒▒▒";:J=J+42:GOTO5507
5530 NEXT
5540 PRINT"Y="A$
5550 GOTO6000
5600 PRINT"▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒";
5610 FORI=33094+JTO33097+J+LEN(A$)
5615 IF33094+J>33687THENPRINT"▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒";:GOTO5540
5620 IFPEEK(I)<>32THENPRINT"▒";:J=J+40:GOTO5610
5622 IFPEEK(I-40)<>32THENPRINT"▒";:J=J+40:GOTO5610
5624 IFPEEK(I+40)<>32THENPRINT"▒";:J=J+40:GOTO5610
5630 NEXT
5640 GOTO5540
6000 GETG$:IFG$=""GOTO6000
9510 PRINT"▒PRESS 1, 2, 3, OR 4 TO INDICATE YOUR
9520 PRINT:PRINT"SELECTION FROM THE LIST BELOW:
9530 PRINT"▒▒▒▒▒1. SAME FUNCTION, SAME RANGE
9540 PRINT"▒▒▒▒▒2. SAME FUNCTION, NEW RANGE
9550 PRINT"▒▒▒▒▒3. NEW FUNCTION
9560 PRINT"▒▒▒▒▒4. END PROGRAM
9600 GETG:IFG=0GOTO9600
9700 ONGGOTO125,85,50,9999
9999 END
READY.
```

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Compulsion

By John Consadine

This is based on the popular Simon game and provides a good lesson in memory testing. It works on any PET machine and has some interesting programming techniques within it.

Note for instance the use of sensible variable names like DELAY (line 740). Although the PET only acknowledges the first two letters of a variable name, you can still work within that restriction to produce meaningful program listings.

```
10 PRINT"▒▒▒"TAB(13)"COMPULSION"
20 PRINTTAB(13)"‾‾‾‾‾‾‾‾‾‾"
30 REM**BY J.CONSADINE (HULL) 21/6/82**
40 PRINT"▒▒▒▒▒DO YOU WANT INSTRUCTIONS? (Y/N)":GOSUB780
50 IFA$="N"THEN160
60 IFA$<>"Y"THENPRINT"▒":GOTO40
70 PRINT"▒▒▒YOU WILL BE SHOWN A RANDOM SEQUENCE"
80 PRINT"▒OF THE NUMBERS-1,2,4,5."
90 PRINT"▒▒▒MEMORISE THE SEQUENCE AND TRY TO"
100 PRINT"▒REPEAT IT BY USING THE KEYS"
110 PRINT"▒CORRESPONDING TO THE NUMBERS SHOWN."
120 PRINT"▒▒▒YOU CAN CHOOSE AN EASY OR HARD GAME"
130 PRINT"▒BUT EACH SUCCESSIVE GO AT THAT LEVEL"
140 PRINT"▒WILL BECOME MORE COMPLEX."
150 PRINT"▒▒▒PRESS ANY KEY TO CONTINUE.":GOSUB780
160 DIMP$(25),BE(25),S(25)
170 P$(1)="▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒"
180 P$(2)="▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒"
190 P$(4)="▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒"
200 P$(5)="▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒"
210 EE$=" ":FORA=1TO200:E$=E$+EE$:NEXT:E$="▒▒"+E$+"▒":REM*ERASE TOP LINES
220 ER$="▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒"
230 NUM(1)=4:NUM(2)=4
240 PRINT"▒▒▒WHAT IS YOUR FIRST NAME";:INPUTN$
250 PRINT"▒▒▒EASY OR HARD GAME (E/H)":GOSUB780
260 IFA$="E"THENDELAY=600:GOTO290
270 IFA$="H"THENDELAY=200:GOTO290
280 GOTO250
290 GOSUB810:REM*DRAW PICTURE
300 PRINTE$:PRINT"▒WHEN YOU ARE READY "N$
310 PRINT"PRESS SPACE BAR.":GOSUB780
320 IFA$<>" "THEN300
330 PRINTE$:PRINT"HERE WE GO!!":GOSUB800:PRINTE$:GOSUB800
340 N=1
350 NO=INT((RND(1)*5)+1):IFNO=3THEN350
360 NO$=STR$(NO):NO$=RIGHT$(NO$,1)
370 PRINTP$(NO)"▒"NO$:FORA=1TODELAY:NEXT
380 PRINTP$(NO)"▒"NO$:FORA=1TODELAY:NEXT
390 S(N)=NO:IFDELAY=600THENIFN=NUM(1)THEN420
400 IFDELAY=200THENIFN=NUM(2)THEN420
410 N=N+1:GOTO350
420 PRINTE$:PRINT"NOW YOU REPEAT THE SEQUENCE!":IFDELAY=600THENNUM=NUM(1)
430 IFDELAY=200THENNUM=NUM(2)
440 FORX=1TONUM
450 GOSUB780:A=VAL(A$)
460 IFA<>S(X)THEN620
470 PRINTP$(A)"▒"A$:FORY=1TO100:NEXT
480 PRINTP$(A)"▒"A$
490 NEXT
500 FORB=1TO20
510 PRINTER$"▒SUCCESS":PRINTP$(1)"▒1":PRINTP$(2)"▒2"
520 PRINTP$(4)"▒4":PRINTP$(5)"▒5"
530 FORX=1TO50:NEXT
540 PRINTER$"▒SUCCESS":PRINTP$(1)"▒1":PRINTP$(2)"▒2"
550 PRINTP$(4)"▒4":PRINTP$(5)"▒5":NEXT
```

```
560 IFDELAY=600THENIFNUM(1)>NO(1)THENBE$=N$:NO(1)=NUM(1)
570 IFDELAY=200THENIFNUM(2)>NO(2)THENBH$=N$:NO(2)=NUM(2)
580 PRINTE$:PRINT"[illegible]BEST HARD GAME IS "BH$" WITH "NO(2)"NUMBERS"
590 PRINT"BEST EASY GAME IS "BE$" WITH "NO(1)"NUMBERS"
600 PRINT"[illegible]PRESS ANY KEY.":GOSUB780
610 GOTO730
620 PRINTE$:PRINT"WRONG--WRONG--WRONG--WRONG!!!"
630 PRINTER$"[illegible]WRONG!":PRINTP$(1)" ":PRINTP$(2)" ":PRINTP$(4)" ":PRINTP$(5)" "
640 FORA=1TO2000:NEXT
650 PRINTE$:PRINT"DO YOU WISH TO SEE CORRECT SEQUENCE?"
660 PRINT"(Y/N)":GOSUB780:IFA$="N"THENNUM(1)=4:NUM(2)=4:GOTO730
670 IFA$<>"Y"THEN650
680 PRINTER$"          ":PRINTE$:PRINT"THIS IS WHAT YOU SHOULD HAVE DONE.":GOSUB800
690 FORX=1TONUM:NO=S(X):NO$=STR$(NO):NO$=RIGHT$(NO$,1)
700 PRINTP$(NO)"[illegible]"NO$:FORA=1TODELAY:NEXT
710 PRINTP$(NO)"[illegible]"NO$:FORA=1TODELAY:NEXT
720 NEXTX:GOTO650
730 PRINTE$:PRINT"ANOTHER GO ?":GOSUB780
740 IFA$="Y"THENIFDELAY=600THENNUM(1)=NUM(1)+1:NUM(2)=4:GOTO240
750 IFA$="Y"THENIFDELAY=200THENNUM(2)=NUM(2)+1:NUM(1)=4:GOTO240
760 IFA$="N"THENEND
770 GOTO730
780 GETA$:IFA$=""THEN780
790 RETURN
800 FORA=1TO1500:NEXT:RETURN
810 PRINT"[illegible]/‾‾\[illegible]/‾‾\"
820 PRINT"[illegible] 4 |----------------| 5 |"
830 PRINT"[illegible]\__/[illegible]\__/"
840 PRINT"[illegible]| [illegible]_______________[illegible]|"
850 PRINT"[illegible]| [illegible] [illegible] [illegible]|"
860 PRINT"[illegible]|   |              |    |"
870 PRINT"[illegible]|   |______________|    |"
880 PRINT"[illegible]|                        |"
890 PRINT"[illegible]/‾‾\[illegible]/‾‾\"
900 PRINT"[illegible] 1 |----------------| 2 |"
910 PRINT"[illegible]\__/                \__/":RETURN
```

Extra code for Keysort

Dear Editor,

In your February issue you listed a machine code Keysort program and said it was suitable for Basic 2 or 4 machines. This is partly true but the author did not take account of the different way in which Basic 4 machines store strings at the top of memory, namely, with a 2 byte garbage collection address at the end of each string pointing back to the length of that string as entered in the array table.

Enclosed is some extra code and a piece of patching that will tidy up these pointers at the end of the sort routine.

The original Keysort routine should be loaded and the moniter entered using SYS 4. Type M 74AE 74B5 and overtype the numbers shown to read as indicated in figure 1. Next type M 7801 7889 and enter the hex code shown in figure 2. The whole block of code should then be saved through the monitor from 7454 to 7889.

The Keysort routine must be called by a *new* address of SYS 30721. This new call in turn uses the whole sort program as a sub-routine and returns to the garbage collection routine upon completion.

The extra code has only a slight effect on the timing for the overall sort.

STEPHEN FELLOWES,
Enfield,
Middlesex.

Figure 1

```
 pc  irq   sr ac xr yr sp
b780 e455 34 33 38 36 f8

74ae a0 02 20 07 78 65 15 85
```

Figure 2

```
7801 20 54 74 4c 13 78 a5 15
7809 85 5e a5 16 85 5f b1 15
7811 18 60 a0 05 b1 5e 85 fc
7819 c8 b1 5e 85 fb 18 a5 5e
7821 69 07 85 5e 90 02 e6 5f
7829 a9 00 85 00 85 01 a0 00
7831 b1 5e 85 02 c9 00 f0 15
7839 c8 b1 5e 85 fd c8 b1 5e
7841 85 fe 38 a5 fd e5 2a a5
7849 fe e5 2b b0 03 4c 67 78
7851 18 a5 fd 65 02 85 fd 90
7859 02 e6 fe a0 00 a5 5e 91
7861 fd c8 a5 5f 91 fd 18 e6
7869 00 d0 02 e6 01 a5 01 c5
7871 fc d0 07 a5 00 c5 fb d0
7879 01 60 18 a5 5e 69 03 85
7881 5e 90 02 e6 5f 4c 2f 78
7889 aa aa aa aa aa aa aa aa
```

Printing from PET to Epson

David Hornsby

Here's a program that will let you print the contents of your PET screen to an Epson printer, dot for dot as it appears on the screen. You will need an MX-80 or MX-100 with type III ROMs (the ones that give the high resolution 'bit image' printing mode), but remember, if you have an earlier MX-series Epson, type III ROM upgrades can be bought and are worthwhile since they give other advantages as well, such as underlining and super and subscripts. The quality of the image is excellent.

The machine code program presented here is written for the Basic 4 machines but is easily modified for Basic 2. If you make use of the assembly listing, lines 1410 to 1480 give the differences. Some will prefer to enter the machine code direct and so a full monitor listing is also provided with the 12 bytes that need altering for Basic 2 users marked in the margin.

Reserve a space

To use the program, first reserve a space at the top of RAM memory as described later on, load it from tape or disk, then type SYS 28672. Nothing will appear to happen but a short routine will have been added to the normal interrupt sequence to test for the simultaneous closure of three keys—both SHIFT keys and the ZERO key on the numeric keypad. When all three are pressed, the computer will 'freeze' and the contents of the screen will be printed out at full printer speed.

This may be done while in immediate mode or at any time while a program is running. The three keys chosen are easy to remember and cannot be pressed with one hand, so the chances of accidental activation are small. To tension the paper, the program first sends a line-feed to the printer. Next, 25 screen lines are sent in bit image mode and at the end the printer bell is sounded and the printer re-initialised so that normal printing can follow immediately afterwards.

While printing, pressing the RVS key will end the printing at the end of the current line. This key has been chosen rather than the usual STOP key since it is a non-printing key and avoids the danger of ending a Basic program you might be running. The interrupt routine may be restored to normal by typing SYS 28683: it is probably safest to leave the machine in this condition if you have finished with the screen dump facility.

An alternative method of using the routine is to insert SYS 28719 into a Basic program (or JSR $702F into a machine code program) at the appropriate point. This has the added advantage of leaving the interrupt routine alone and not 'freezing' the computer during printing. This means, for instance, that the clock will continue undisturbed.

The program is fast. The time for one screen dump is around 46 seconds on an MX-80 and is limited by the printer, not the program. Only 'upper case and graphics mode' is catered for since, although it would be easy enough to include the extra code and look-up table for 'lower case mode', most people can already print upper case and lower case letters to their printer.

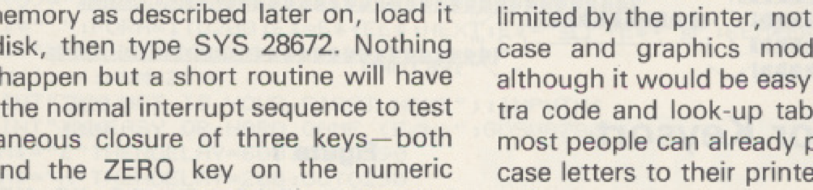
Epson characters are much better than CBM screen characters, so this program only caters for what is normally hardest: the graphics.

Entering the program

The program has been written for a 32K memory machine. The code is 1288 bytes long and so will fit 8 or 16k machines readily enough, but you will have to figure out the few changes required.

To enter the monitor listing, first reserve an area of RAM from $7000 onwards by entering:

POKE 53,112: POKE 52.0: CLR



PET version of the starship Enterprise

Then enter the machine code monitor with SYS 4. The monitor listing has been made in seven blocks of one screenful each. Type in .M 7000 70B0 to display a screen of bytes. Use the cursor to set these to the values of the first block. Enter the next six blocks in a similar way.

When this is done, save the code on tape with

```
.S"EPSON DUMP", 01,7000,7508
```

or on disk with

```
.S"EPSON DUMP",08,7000,7508.
```

Next exit from monitor with the .X command and enter the following short program which will check the data you have just entered.

```
100 FOR N=0 TO 6
110 SUM=0
120 FOR X=0 TO 183
130 SUM=SUM+PEEK(28672+184*N+X)
140 NEXT X
150 ?SUM
160 TTAL=TTAL+SUM :REM TTAL IS
    RUNNING TOTAL
170 NEXT N
180 ?"TOTAL="TTAL
```

If all is well this will, when run, give the following results:

```
24129
19172
12259
10183
 8819
10761
12652
TOTAL=97975
```

If the total is incorrect then check each of the preceding seven numbers to see which of the blocks is in error.

When subsequently loading the program from tape or disk, remember to reserve space at the end of RAM for it with the POKES described earlier.

If you hate typing in programs yourself, write to me at 61 Germander Place, Conniburrow, Milton Keynes MK14 7DW and I'll send you a copy—£2 for a tape or £3 for a disk (4040).

Happy dumping!

1.

```
 PC   IRQ  SR AC XR YR SP
B780 E455 32 38 2C 34 F5

                                BASIC 2

7000 78 A9 16 85 90 A9 70 85
7008 91 58 60 78 A9 55 85 90     2E
7010 A9 E4 85 91 58 60 78 A9   E6
7018 08 8D 10 E8 AD 12 E8 A2
7020 E9 8E 10 E8 C9 9E D0 03
7028 20 2F 70 58 4C 55 E4 A9    2E E6
7030 00 85 D1 85 D3 A9 04 85
7038 D2 85 D4 20 63 F5 A6 D2     24
7040 20 C9 FF 20 34 D5 A9 1B    D0 FD
7048 20 D2 FF A9 33 20 D2 FF
7050 A9 18 20 D2 FF A9 00 85
7058 01 A9 80 85 02 A9 08 85
7060 C9 A9 71 85 CA A9 19 85
7068 4F A2 00 A9 1B 20 D2 FF
7070 A9 4B 20 D2 FF A9 40 20
7078 D2 FF A9 01 20 D2 FF 8A
7080 A8 B1 01 85 C7 A9 7F C5
7088 C7 B0 0D A9 FF 85 A2 A9
7090 7F 25 C7 85 C7 4C 9C 70
7098 A9 00 85 A2 A9 00 85 C8
70A0 06 C7 26 C8 06 C7 26 C8
70A8 06 C7 26 C8 18 A5 C7 65
70B0 C9 85 C7 90 02 E6 C8 18
```

2.

```
                                 BASIC 2

70B8 A5 C8 65 CA 85 C8 A0 00
70C0 B1 C7 45 A2 20 D2 FF C8
70C8 98 C9 08 D0 F3 E8 8A C9
70D0 28 D0 AC AD 12 E8 C9 FE
70D8 F0 15 20 34 D5 18 A5 01    D0 FD
70E0 69 28 85 01 90 02 E6 02
70E8 C6 4F F0 03 4C 69 70 A9
70F0 07 20 D2 FF A9 1B 20 D2
70F8 FF A9 40 20 D2 FF 20 34        D0
7100 D5 20 CC FF 20 E0 F2 60   FD  AC
7108 00 00 38 44 92 AA 72 00
7110 00 3E 50 90 90 50 3E 00
7118 00 82 FE 92 92 92 6C 00
7120 00 38 44 82 82 82 44 00
7128 00 82 FE 82 82 44 38 00
7130 00 FE 92 92 92 82 82 00
7138 00 FE 90 90 90 80 80 00
7140 00 38 44 82 92 92 5C 00
7148 00 FE 10 10 10 10 FE 00
7150 00 00 00 82 FE 82 00 00
7158 00 04 02 02 82 FC 80 00
7160 00 FE 10 10 28 44 82 00
7168 00 FE 02 02 02 02 02 00
```

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— control relay for Vic and 64

Light up with **Rel. Rel** is a control relay that plugs straight into the user port to give simple, programmable switching of electrical apparatus in the home, office or factory. Its six relay outputs can control devices and two inputs allow the Vic to read signals from external sources. **Rel** eliminates black boxes full of wires and represents one of the most exciting value-for-money, firmware additions to any Vic or 64 computer system.

'64'	£33.00

SWITCH
— disk sharing system for the Vic, 64 and PET

The **Switch** will allow up to 8 Vic 20's or 64's and up to 15 PET's to use the same disk drive. This allows you to set up a multi-PET, multi-64 and multi-Vic system with all the units connected sharing the capacity of the disk drive; thus allowing true 'distributed' processing to occur at a fraction of the normal cost. The **Switch** will also allow for multiple disk configurations as well, and is complete with 'site active' indicator.

'8000' Controller	£150.00
Daughter Units	£ 98.00
'64' and 'Vic' Controller	£ 85.00

STAT
— a statistical calculation package for Vic and 64

Crunch and display with **Stat**. A plug in cartridge that undertakes statistical calculations — such as Meanvalues, Standard deviations and Variances — and displays using single commands. Other one word commands allow you to draw vertical and horizontal bar charts, to plot graphs, and to specify the scales and the colours used by these commands. It will also sort numeric and character strings. Finally, all or part of screen displays can be copied to the Vic printer. **Stat** comes complete with a detailed operating guide.

'64'	£33.00
Vic	£25.00

GRAF
— plotting package for the Vic

Plot away with **Graf**. This cartridge allows you to explore the complicated equations and functions of graphs. The menu screen activated by the Vic's special function keys, will automatically plot a graph, define new functions, calculate accurate values of an intersection, find the maxima and minima of a function. Simple editing allows you to check current functions and to change them.

'Vic'	£25.00

All products available from Kobra or from the nationwide Commodore dealer network. All prices exclude VAT.

Company: Kobra Micro Marketing
Address: PO Box 28, Henley-on-Thames, Oxon RG9 1PF.
Tel: Henley-on-Thames (04912) 2512

3.

```
7170 00 FE 40 30 30 40 FE 00
7178 00 FE 40 20 10 08 FE 00
7180 00 38 44 82 82 44 38 00
7188 00 FE 90 90 90 90 60 00
7190 00 38 44 82 8A 44 3A 00
7198 00 FE 90 90 98 94 62 00
71A0 00 00 64 92 92 92 4C 00
71A8 00 00 80 80 FE 80 80 00
71B0 00 FC 02 02 02 02 FC 00
71B8 00 E0 18 06 06 18 E0 00
71C0 00 FE 04 18 18 04 FE 00
71C8 00 C6 28 10 10 28 C6 00
71D0 00 00 E0 10 1E 10 E0 00
71D8 00 86 8A 92 92 A2 C2 00
71E0 00 00 FE 82 82 82 00 00
71E8 00 40 20 10 08 04 02 00
71F0 00 00 82 82 82 FE 00 00
71F8 00 00 10 20 7F 20 10 00
7200 00 08 !C 2A 08 08 08 08
7208 00 00 00 00 00 00 00 00
7210 00 00 00 00 F2 00 0C 00
7218 00 00 E0 00 00 E0 00 00
7220 00 28 FE 28 28 FE 28 00
```

4.

```
72E0 00 00 00 01 26 00 00 00
72E8 00 10 38 6C C6 82 82 00
72F0 00 28 28 28 28 28 28 00
72F8 00 82 82 C6 6C 38 10 00
7300 00 40 80 8A 90 90 60 00
7308 08 08 08 08 08 08 08 08
7310 00 18 3A 7E FE 7E 3A 18
7318 00 00 00 FF 00 00 00 00
7320 10 10 10 10 10 10 10 10
7328 20 20 20 20 20 20 20 20
7330 40 40 40 40 40 40 40 40
7338 04 04 04 04 04 04 04 04
7340 00 00 FF 00 00 00 00 00
7348 00 00 00 00 00 FF 00 00
7350 08 08 08 04 03 00 00 00
7358 00 00 00 00 E0 10 08 08
7360 08 08 08 10 E0 00 00 00
7368 FF 01 01 01 01 01 01 01
7370 80 40 20 10 08 04 02 01
7378 01 02 04 08 10 20 40 80
7380 FF 80 80 80 80 80 80 80
7388 80 80 80 80 80 80 80 FF
7390 00 00 3C 7E 7E 7E 3C 00
```

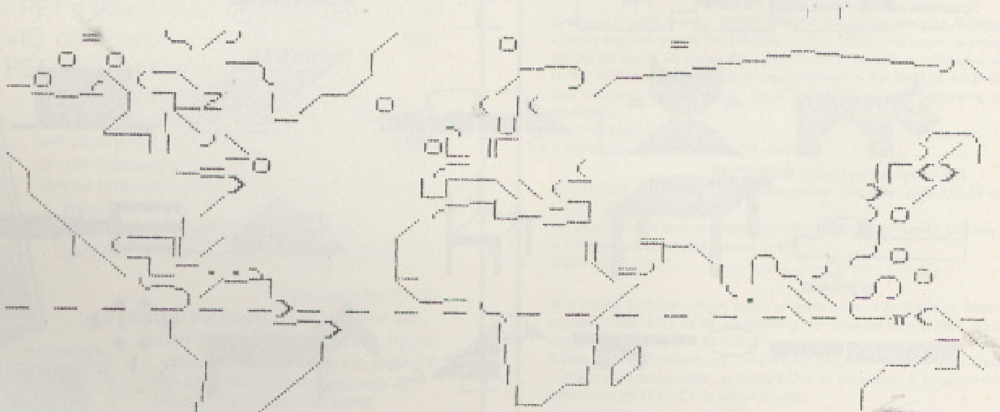
5.

```
7228 00 00 24 54 FE 54 48 00
7230 00 62 64 08 10 26 46 00
7238 00 6C 92 92 6A 04 0A 00
7240 00 00 00 20 40 80 00 00
7248 00 00 00 38 44 82 00 00
7250 00 00 82 44 38 00 00 00
7258 00 00 54 38 FE 38 54 00
7260 00 00 10 10 7C 10 10 00
7268 00 00 00 01 06 00 00 00
7270 00 00 10 10 10 10 10 00
7278 00 00 00 06 06 00 00 00
7280 00 02 04 08 10 20 40 00
7288 00 7C 8A 92 92 A2 7C 00
7290 00 00 22 42 FE 02 02 00
7298 00 46 8A 8A 92 92 62 00
72A0 00 44 82 92 92 92 6C 00
72A8 00 08 18 28 48 FE 08 00
72B0 00 E4 A2 A2 A2 94 88 00
72B8 00 00 3C 52 92 92 0C 00
72C0 00 C0 80 8E 90 A0 C0 00
72C8 00 6C 92 92 92 92 6C 00
72D0 00 60 92 92 92 94 78 00
72D8 00 00 00 00 24 00 00 00
```

6.

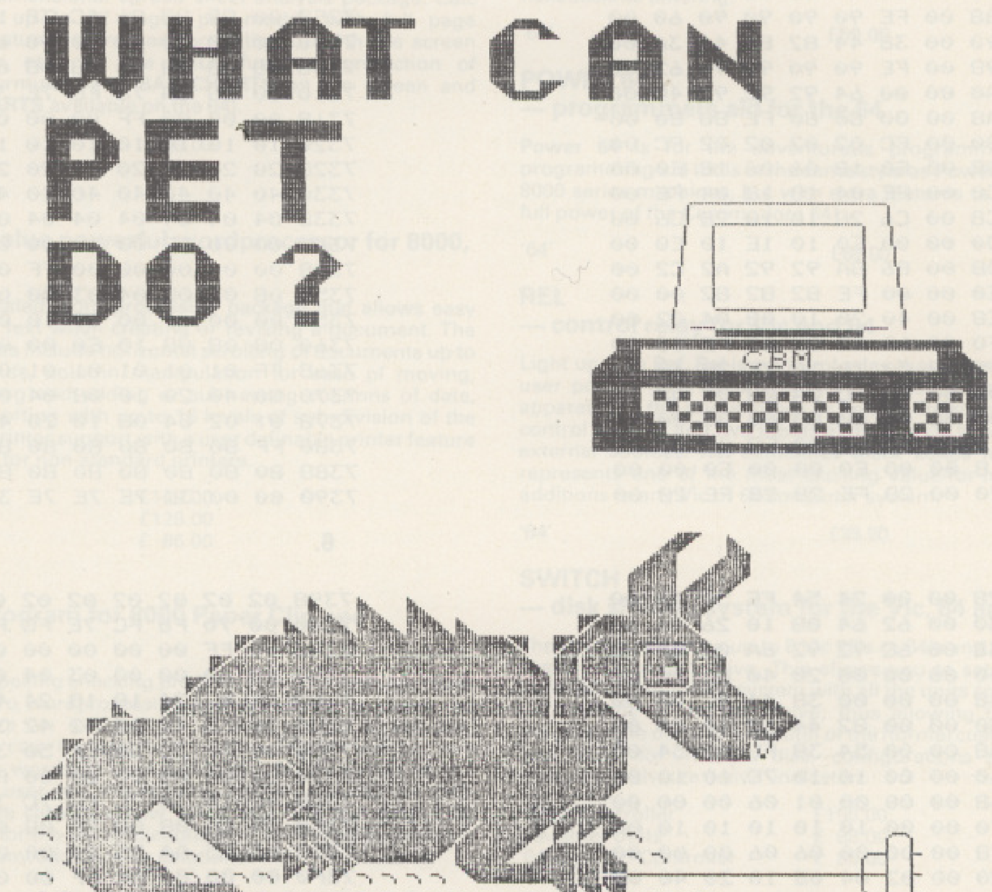
```
7398 02 02 02 02 02 02 02 02
73A0 00 70 F8 FC 7E FC F8 70
73A8 00 FF 00 00 00 00 00 00
73B0 00 00 00 00 03 04 08 08
73B8 81 42 24 18 18 24 42 81
73C0 00 3C 42 42 42 42 3C 00
73C8 00 10 38 50 EF 50 38 10
73D0 00 00 00 00 00 00 FF 00
73D8 00 10 38 7C FE 7C 38 10
73E0 08 08 08 08 FF 08 08 08
73E8 AA 55 AA 55 00 00 00 00
73F0 00 00 00 00 FF 00 00 00
73F8 00 08 10 1E 10 1E 10 20
7400 80 C0 E0 F0 F8 FC FE FF
7408 00 00 00 00 00 00 00 00
7410 FF FF FF FF 00 00 00 00
7418 0F 0F 0F 0F 0F 0F 0F 0F
7420 80 80 80 80 80 80 80 80
7428 01 01 01 01 01 01 01 01
7430 FF 00 00 00 00 00 00 00
7438 AA 55 AA 55 AA 55 AA 55
7440 00 00 00 00 00 00 00 FF
7448 0A 05 0A 05 0A 05 0A 05
```

▶ 45



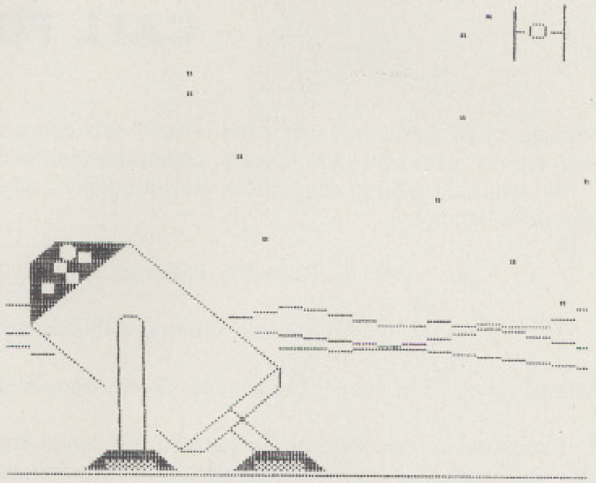
PET version of the world

Examples of PET graphics on Epson printer


WHAT CAN PET DO?
CBM

7.

```
7450 FF FE FC F8 F0 E0 C0 80
7458 00 00 00 00 00 00 FF FF
7460 00 00 00 00 FF 08 08 08
7468 00 00 00 00 0F 0F 0F 0F
7470 00 00 00 00 F8 08 08 08
7478 08 08 08 08 0F 00 00 00
7480 03 03 03 03 03 03 03 03
7488 00 00 00 00 0F 08 08 08
7490 08 08 08 08 F8 08 08 08
7498 08 08 08 08 0F 08 08 08
74A0 08 08 08 08 FF 00 00 00
74A8 FF FF 00 00 00 00 00 00
74B0 FF FF FF 00 00 00 00 00
74B8 00 00 00 00 00 FF FF FF
74C0 C0 C0 C0 C0 C0 C0 C0 C0
74C8 E0 E0 E0 E0 E0 E0 E0 E0
74D0 07 07 07 07 07 07 07 07
74D8 01 01 01 01 01 01 01 FF
74E0 0F 0F 0F 0F 00 00 00 00
74E8 00 00 00 00 F0 F0 F0 F0
74F0 08 08 08 08 F8 00 00 00
74F8 F0 F0 F0 F0 00 00 00 00
7500 F0 F0 F0 F0 0F 0F 0F 0F
```



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A WINDOW ON YOUR DISK! Our 'Simply Recover' disk file repair kit (4040 only at present) will allow you to save crashed files, append BASIC or m/c subroutines, change disk names and IDs, devise protection systems, etc. Disk & detailed instructions £17.

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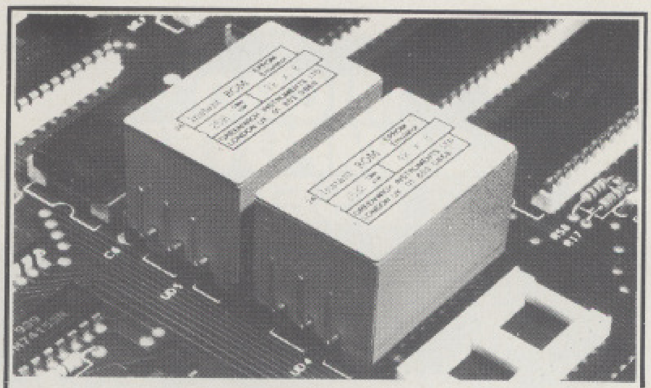

INSTANT ROM (Commodore Approved)

Greenwich Instruments' ROM/EPROM Emulators are non-volatile memory modules which plug into any ROM/EPROM socket. When the power is switched off, data is retained for up to 10 years. Emulators from 2 Kbytes to 32Kbytes are available.
In the PET, a 4Kbyte Emulator can be fitted in the 9000 or A000 socket, and used for fast program development. Basic or **Machine**-code programs can be stored permanently.

GR2532 4Kbyte Emulator £56.00
Adaptor GA1 (essential for PET users) .... £ 6.00

PETCLOCK (Commodore Approved)

PETCLOCK plugs into any Commodore machine with User-Port, and gives time (hour/minute/second) and date (year/month/date/day of week). Battery backup—accuracy is maintained when the power is off.

GCC1 PETCLOCK £62.00

G-ROM E

A 4 Kbyte EPROM which runs, at switch-on, any Basic or Machine-code program stored in INSTANT ROM, eliminating the need for tape or disc. Basic programs can be stored with a few key-strokes.
Some powerful utilities are included for program revival. PET's power-up memory test is made non-destructive, and UN-NEW us provided. A program for reading Date and time from PETCLOCK is also included.

G-ROM E (specify type of PET) £25.00

Postage (£1.00) and VAT are extra. Leaflets are available.

**GREENWICH INSTRUMENTS LIMITED, 22 BARDSLEY LANE,
GREENWICH, LONDON SE10 9RF.
Tel: 01-853 0868. Telex 896691 Attn. GIL.**

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Papers on primary, secondary and tertiary curriculum subject teaching, control, logo, prolog, special education, examinations, administration, library, communication networks etc, are particularly sought.

We would be glad to receive proposals for papers. Abstracts of two hundred words or less should be sent to the Conference Organiser:

Mrs E. Ramsden, Dacorum College, Marlowes, Hemel Hempstead, Hertfordshire

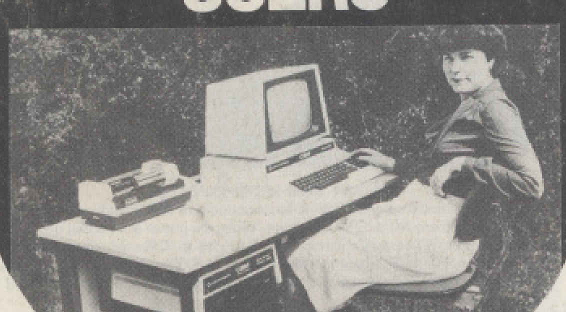
Those wishing to book for the conference should write to:

Miss J. Frost, Educational Conference, Commodore Business Machines, 675 Ajax Avenue, Slough, Berkshire SL1 4BG.

Exact cost has not yet been finalised but full board (including accommodation on the college campus, conference dinner and conference proceedings) should be approximately £50.00 for three days or £20.00 per day. Non-residential delegates are welcome at approximately £9.00 (conference dinner and proceedings extra). Special discounted travel arrangements between British Rail and the college will be announced shortly.

The proceedings will be published by Ellis Horwood Ltd in a similar form to Microcomputers in Education — the proceedings of our first conference.

MICRO COMPUTER USERS



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24 Church Street, Slough SL1 1PT. Telephone: Slough (STD 0753) 71535

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Britain's leading games software house are proud to announce our new range of exciting games and other software for Vic20 and ZX81 (see panel). (Games for BBC, Dragon, Spectrum and Atari available soon.)

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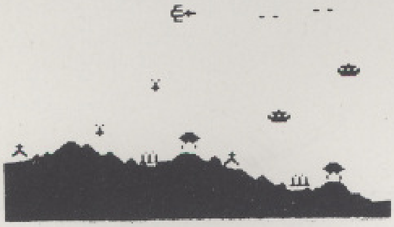
For unexpanded Vic20

Skim as close as you dare to the surface of the planet, devastating the Martian cities, destroying ammunition dumps (gaining more time), shooting down the ground-to-air missiles



"A real action shot of the game"

MOONS OF JUPITER

For expanded Vic20, 3K, 8K or 16K

You are the Commander of a fleet of destroyers looking on from the safety of a mother ship, you send in one destroyer at a time to blast a passage through the **MOONS OF JUPITER. Your destroyers have to dodge, and blast the UFOs . . . Watch out for the Gologs** they can smash your destroyers, but you cannot harm them.

A MACHINE CODE ARCADE QUALITY GAME

MIND TWISTERS

For unexpanded Vic20
Four games to stretch your brain

Blackjack, Decipher, Four Thought and Teaser are our computerised versions of very popular home games and will test your mental agility and skill for many a long hour.

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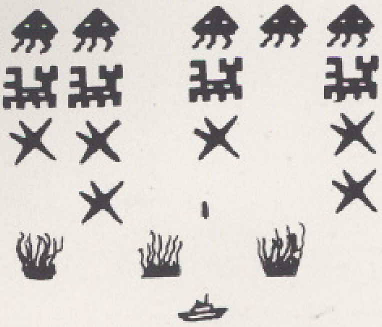
Unexpanded Vic20

Fight off the attacking sea creatures for as long as you can. Shoot the whale for a surprise score, watch out for the crabs, starfish and octopuses.



MULTISOUND SYNTHESIZER

For the unexpanded Vic20

The Vic Multisound Synthesiser is very flexible and can be played in more ways than can ever be explained here, to create music and special effects. For example, create any tune, up to 255 notes (after following appropriate instructions), then press "F1" or "F3", then key "9" and enjoy the added effect. Now hit "+", listen to the difference. For a surprise — hit "–". Now add a melody over the top — hit key "8" then "7" — now play a melody, or experiment. *Have fun!*

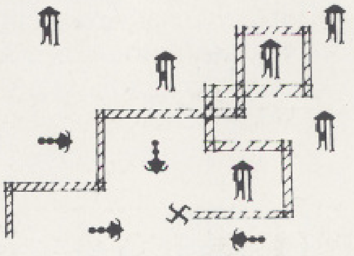
ROBOT PANIC

A fantastic high-speed game on cartridge. The price is yet to be announced, but around £16 . . .

SHARK ATTACK

For unexpanded Vic20

You are in shark-infested waters after being thrown overboard from a pirate ship. Your only protection being an atomic net which you trail behind you, trying to cover all the visible ocean and ensnare the sharks at the same time. Beware of stopping or covering your tracks for too long, if you do, then the sharks will escape and come after you. Watch out for the ever increasing deadly octopi (somtimes the sharks will eat part or all of one!)



"A real action shot of the game"

NEW NEW NEW

SPACE ATTACK

For the unexpanded Vic20

SPACE ATTACK is a game of skill. You as the pilot of an intergalactic battleship have to fight your way through wave after wave of various alien spaceships.

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News

Oxford expands the Petspeed range

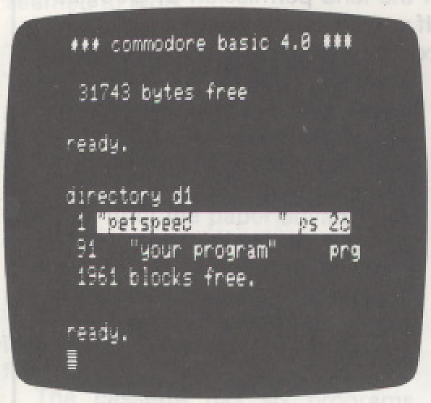
Following on from Compiled Integer Basic and Petspeed, Oxford Computer Systems, Hensington Road, Woodstock, Oxford OX7 1JR (Tel: 0993-812700) have introduced the Petspeed 64 compiler which enables programs to run up to 40 times faster.

Petspeed breaks programs down into tiny fragments and reassembles them in simpler form, the resulting programs taking up considerably less memory.

The system disk supplied with the manual cannot itself be used to compile programs. Before Petspeed can be used it is necessary to create two master disks, a Petspeed master and a utilities master. When further Petspeed or utility disks are required, they should be made from the masters and not the system disk which should only be used if the masters become corrupt.

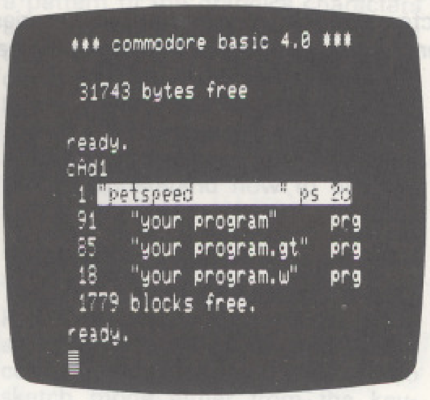
Although Petspeed can handle floating point arithmetic with the same effect as Pet Basic, it can also, unlike the Pet, do much faster integer arithmetic. This is not uncommon in Basic compilers, but Petspeed goes one step further. It can find for itself all the variables that always contain integers and even those which can sometimes be integer.

Petspeed never does floating point arithmetic when integer arithmetic would be sufficient. This applies not only to variables but to individual array elements.



```
### commodore basic 4.0 ###

 31743 bytes free

ready.

directory d1
 1 "petspeed          " ps 2c
 91   "your program"      prg
 1961 blocks free.

ready.
```

Directory before compilation



```
### commodore basic 4.0 ###

 31743 bytes free

ready.
cÂd1
 1 "petspeed          " ps 2c
 91   "your program"      prg
 85   "your program.gt"   prg
 18   "your program.w"    prg
 1779 blocks free.
ready.
```

Directory after compilation

Heading for a million and still growing

According to a survey commissioned by Gowling Market Services Ltd of Liverpool, the number of British families who own a computer is just under one million and the figure could double by the end of 1985. The survey of 2,000 households was conducted in January and February 1983 by the British Market Research Bureau.

Although the birth of the home computer has made computer power available to everybody, the market is still dominated by male buyers, many of whom are teenagers: 45 per cent of home computer users are aged 18 or under. Most of them belong to upper and lower middle class households. The most popular makes include the VIC-20.

The most popular application is the arcade game, although more than 25 per cent of households use them for educational purposes.

Copies of the survey report are available from Gowling Market Services Ltd, Britannia Buildings, Fenwick Street, Liverpool L2 7NA (Tel: 051-236 6036).

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Hi-res displays

BUSINESS AND PLEASURE ON THE 64!

The Commodore 64 is the ideal machine to combine business with pleasure. It has a typewriter keyboard and lots of memory — ideal for word processing or financial planning — plus some rather clever colour and sound chips that are just what you need for realistic arcade action.

BUSICALC is just the program for those who need to juggle with figures. You could use it to plan your household finances or your personal tax — but it's equally capable of handling much larger figures. If you've got a printer you'll be able to produce reports that are good enough to put before the board (or the bank manager) — but a printer isn't necessary, and neither is a disk drive. BUSICALC costs just £39 plus VAT on tape, or £40.50 on disk; there are versions at the same prices for the PET and VIC-20 (with 16k expansion).

The best word processor you can buy for the 64 is VIZAWRITE. The first thing you'll like is being able to use it right away — you won't have to re-read the manual ninety-four times to find out how to get started. The next is the wide range of printers you can use from the VIC printer to a Diablo or Qume — plus many others in between (like the Epson). Virtually any parallel printer can be operated off the User Port for the price of a simple cable, and features such as underlining, superscripts, subscriptions, and emphasised printing are easily accessed. Formatting on screen means that you can see the text as it will print before it prints — and this isn't the only resemblance between VIZAWRITE and dedicated word processing stations costing £10,000 or more. VIZAWRITE costs a mere £69 plus VAT on disk; a tape-based version should be available very soon.

MIKRO ASSEMBLER plugs into the cartridge port of the 64. As PET and VIC owners are already well aware, MIKRO makes writing machine code programs almost as easy as Basic, because it is a real assembler with LABELS. To help you write your program MIKRO has AUTO, DELETE, and FIND commands; to help you debug it there's a machine code monitor; and you can DISASSEMBLE from Basic or in the monitor! The TABLE commands displays or prints an alphabetically sorted symbol table after assembly — which is really fast (MIKRO will assemble 2k of code in just 20 seconds). If you are writing more than (say) 4k of code you may have to split your source code into several files, but MIKRO will automatically link these together at assembly time, loading them from tape or disk as appropriate. The MIKRO module costs £50 plus VAT; it could be the best investment you ever make.

With ARROW installed in your 64 the Commodore cassette unit LOADS AND SAVES PROGRAMS SEVEN TIMES FASTER! Almost as fast as the 1541 disk, in fact. There is however a small difference in price — because ARROW costs just £39 plus VAT. ARROW has its own load and save commands, so you can still load and save at normal speed if you should want to. ARROW is a tried and tested product that we've been selling on the PET for several years; now 64 owners can also benefit.

Now for the lighter side of our range. TANK ATAK, KAKTUS and MANGROVE are arcade games with colour and sound; a joystick is recommended, but is not esential. They each cost £8 plus VAT on cassette or £9.50 on disk. THE HITCH-HIKER'S GUIDE TO THE GALAXY is an adventure based (with the kind permission of Douglas Adams and Pan Books) on the characters and scenarios in the popular series. If you divide the price of £12 plus VAT (£13.50 on disk) by the number of hours you'll spend exploring the galaxy the answer will be a very small number indeed!

Supersoft
Winchester House, Canning Road,
Wealdstone, Harrow,
Middlesex, HA3 7SJ, England
Telephone: 01-861 1166

Putting the VP42 through its paces

Whether your interest is business, games or education, you'll appreciate this 40 column printer from Alphacom. It's fast, efficient and reasonably priced and the pack includes five useful demo programs.

The VP42 is a 40 column printer produced by Alphacom and aimed at the home computer market. It works with the VIC-20 and the 64 and connects via an interface which is supplied with the printer.

The output rate is 80 characters per second, fast enough for most applications, or at least most I could think of while testing it. Along with the printer and the interface you receive a manual, cassette and a book.

The manual

This is well presented, covering the features and applications of the printer. It can be understood by the novice as well as the expert and is applicable to both. It describes the printing of upper/lower case and graphic characters, directly or in programs.

One interesting feature is the ability to change the device number from 0 through to 30. This is achieved by changing the first five switch locations, located under the paper position.

The manual also gives information on the specifications and various tables for users. I spent two hours going through the manual and everything they say the VP42 should do seemed to work.

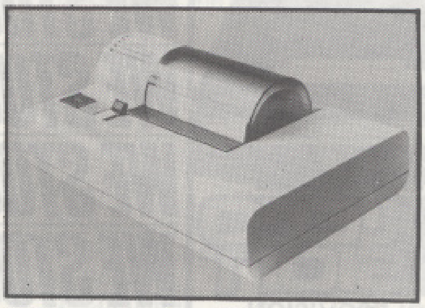
Tests itself

The VP42 will carry out a self-test on power-up if you hold down the paper advance key and depress the power key; it prints a series of 8s and goes on to test all the characters and graphics until the paper advance key is pressed again. It does the test repeatedly; you can easily become mesmerised and waste a lot of paper.

The standard thermographic printing paper comes in roll or fan-fold form.

The cassette has six programs. The first is a menu program for the five demo programs and while it is good it can be omitted, thus saving the need to rewind and load it.

The first demo program is called Word Processor. I found this difficult to operate and I had to take a listing to discover the functions and possibilities. It could do with a few simple instructions. Otherwise a simple but effective word processor, limited by the amount of RAM available. It allows you to write text, edit it and display on screen or dump to printer; also to read or write to tape and erase text. Both the menu and the Word Processor program are well presented, in colour and graphics.



VP42 printer from Alphacom

The second demo program, called Kaleidoscope, displays on the screen a pattern of the graphics characters and constantly updates them. You can at any time dump the current display to the printer by pressing any key. It's worth studying the listing to see how the program is put together. All the programs are in Basic, helping you to understand how to use the printer.

Combinations

The third program is called Sketch Pad. Your first option here is to select one of 16 screen and border colour combinations. Then into sketch mode either from the keyboard or using a joystick (you'll need a multi-directional stick). Draw anything you like, then dump it onto the printer. An enjoyable program and possibly useful. It uses a noise pulse so you can hear what you are doing!

The fourth program, called Record Keeper, will keep records in files on tape of anything you wish to create – ideal for domestic use. You can also dump the files onto the printer and edit any file previously saved to tape.

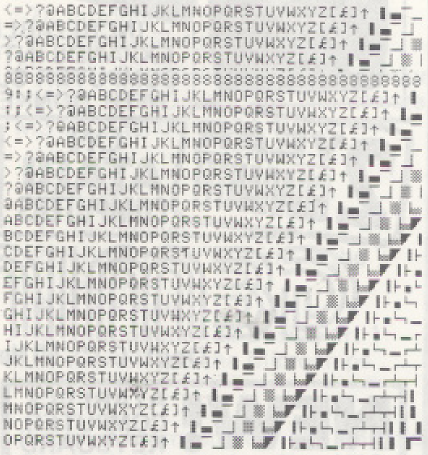
The fifth demo program, Screen Printer, dumps anything currently on the screen to the printer. Although it is short and simple, by studying it closely one can learn a great deal about the printer's uses.

The book, *Compute's* book for the VIC, is full of listings to type in, including games, educational and business applications. There have been reports of a few bugs in the listings, but I am sure *Compute* will rectify these.

Conclusion

The VP42 is restricted to home use, mainly because the printouts are not presentable to customers, being under A4 size. Given that limitation, both the novice and the expert programmer can use this printer for many applications. Even for those who are not interested in programming, the printer is a versatile aid for business, educational and games computing.

Considering what the package contains, the range of uses, and the speed of operation, the printer is relatively inexpensive at £137.99. At present it is available by mail order only from Dean Electronics Ltd, Glendale Park, Fernbank Road, Ascot, Berkshire (tel 0344-885661 telex 849242).



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LMNOPQRSTUVWXYZ[£]↑
MNOPQRSTUVWXYZ[£]↑
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OPQRSTUVWXYZ[£]↑
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Sample printout from the VP42's self-test program

Bees, caterpillars and monkey saddles

Fun Mathematics on your Microcomputer
by Czes Kosniowski (Cambridge University Press, The Edinburgh Building, Shaftesbury Road, Cambridge CB2, Tel. 0223-312393). Price £4.95.

Did you ever want to know how scout bees tell other bees the whereabouts of a new source of food? Or how far a caterpillar will walk along a continually stretching piece of elastic? Or how to plot a 'monkey saddle' on your screen? Czes Kosniowski tells you all this and much more in an interesting, useful book for owners of home and business computers.

The book is not written specifically for any particular microcomputer, but is so constructed that all the programs will, with slight modifications, work on your own computer. Where program commands differ from the norm, instructions are given to convert these to another dialect of Basic. Or if this proves too difficult, programs are rewritten and you are presented with versions for VICs, Sinclairs and so on.

As a result, some of the programs are not as concise as they might be. The author acknowledges this and notes that part of the fun of computer programing is 'doing it for yourself' rather than blindly following someone else's instructions.

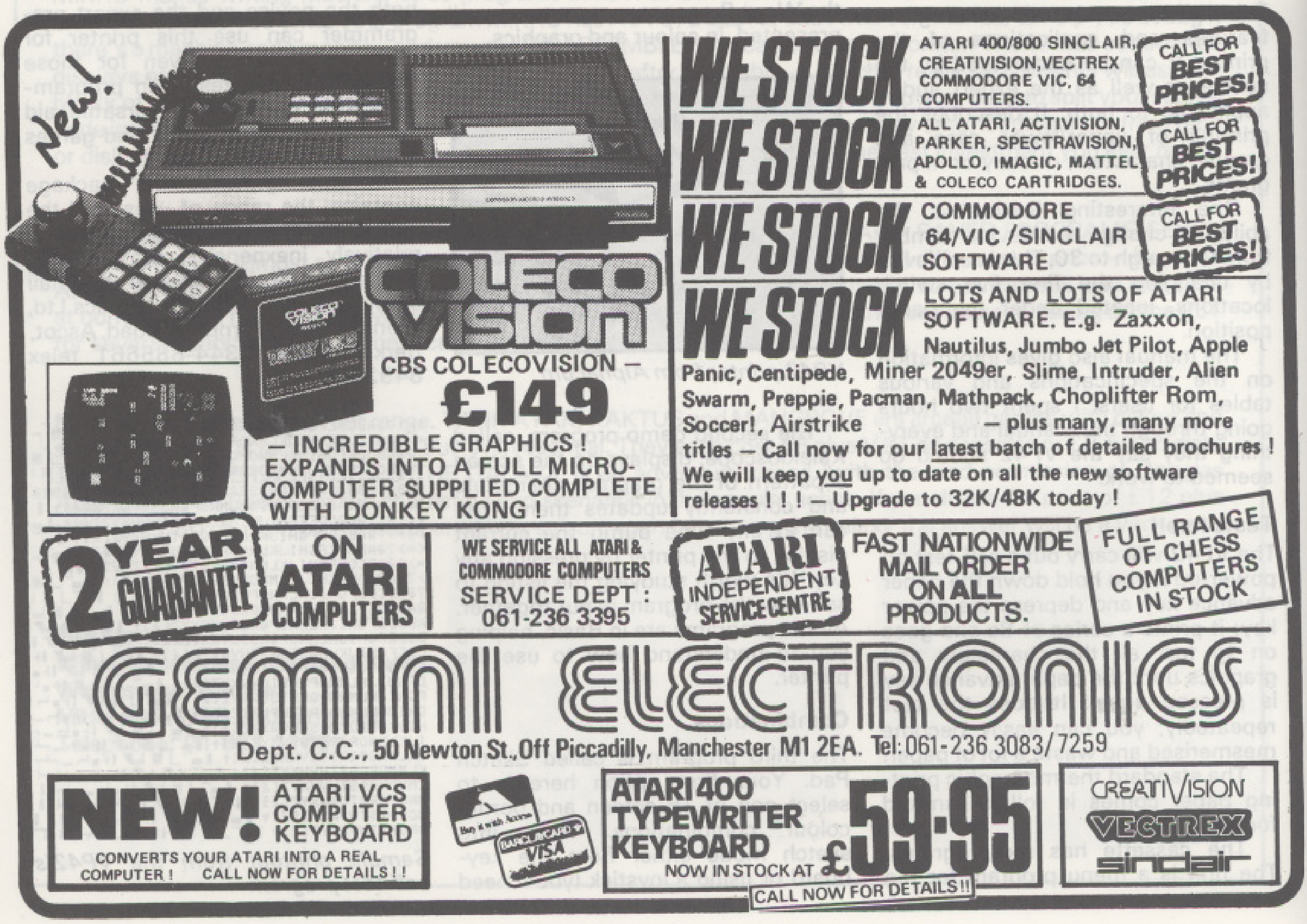
The book is visually appealing; program listings and screen illustrations are presented in blue, along with the more usual black-on-white program descriptions and accompanying notes. Attractively bound and well presented throughout, it makes you wonder why other publishers cannot produce 200-page books for £4.95.

Lucidly explained

Content, as you might gather from the title, is based heavily on mathematics and mathematical theory. However, if your knowledge of the higher reaches of mathematics is limited to pushing buttons on a calculator (or indeed entering programs into a microcomputer) fret not. Where necessary everything is lucidly explained, punctuated with a quaint use of English from time to time.

For example, the index is referred to on the contents page as 'Where it is'. The first chapter is called 'Start here'. Such quirks however, add to the overall charm of the book.

The first chapter delves into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mathematical sequences, geometric, harmonic, converging and diverging series, and more. It also, en route, gives you the answer to the caterpillar on elastic band problem! To round off, there is a stimulating intelligence test.

The chapter on functions, graphs and polar co-ordinates provides the answer to the honey bee problem, as well as many plotting programs. Included in the section on matrices is a useful program for plotting the results of a matrix onto the screen.

The chapter on games offers strategies for the various listings, but even more engrossing is the section called Pretty Pictures. Here we find the monkey saddle, revealed as one of the outputs of a program called Surfaces.

Conclusion

An absorbing book that should find a place in many a computer owner's library. Good value for money and well presented; with the occasional spelling mistake.

Anyone with more than a passing interest in his or her computer, who wants to make it perform more interesting functions and understand how it performs those functions, will enjoy Mr Kosniowski's work.

News

Swapping technology

A technology exchange agreement between Commodore International Ltd and Zilog Inc, an affiliate of the Exxon Corporation, gives Commodore a licence to manufacture Zilog's Z800 16-bit microprocessor and related support circuits for use in Commodore microcomputers. Commodore will supply Zilog with mask sets and manufacturing rights to selected custom circuits.

Substantial

According to Commodore Chairman Mr Irving Gould, his company will be able to use a substantial portion of Zilog's production facilities to make integrated circuits for exclusive use in Commodore micros. Commodore plan to double their own semi-conductor facilities in the next 12 months.

Software sellers

This monthly feature is intended as a guide to the best-selling home software – games and educational packs. Each listing reflects sales in the month prior to publication, in this case March.

VIC-20

1) Exterminator
2) Krazy Kong
3) Chopper Raid
4) Quiz Master
5) Sad Faces
6) Motorway
7) Sprint
8) Label
9) Moneybags
10) Mars Mission

CBM 64

1) Word Wizard
2) Quizzer
3) Alien Panic
4) Poster Printer
5) Label Printer
6) Krazy Kong
7) Cavern Run

(From the Computer Room, 87 High Street, Tonbridge, Kent, tel 0732-355962. Mail order.)

VIC-20

1) CalcResult
2) Paperclip
3) Pal 64
4) Power 64
5) Forth 64
6) VIC 64 Rel
7) Grid 64
8) Attack of the Mutant Camels
9) Startrek
10) Diary 64

CBM 64

1) Gridrunner
2) Laser Zone
3) Avenger
4) Sargon II Chess
5) Colonel's House
6) Andes Attack
7) Hopper
8) Scramble
9) VIC Rescue
10) Alien Attack

(From the VIC Centre, 154 Victoria Road, North Acton, London W3, tel. 01-922 9904. Direct/mail order.)

VIC-20

1) Jumping Jack
2) Starship Escape
3) Bonzo
4) Choplifter
5) Triad
6) Engine Shed
7) Skramble
8) Sargon II Chess
9) Tomb of Drewan
10) Avenger

CBM 64

1) Screen Graphics
2) Synthy 64
3) Graphics Editor
4) Adventure Park
5) Graverobbers
6) Monopole
7) Introduction to Basic Part 1
8) Gortek and the Microchips

(From Sumlock, Royal London House, 198 Deansgate, Manchester M3 3NE, tel 061-834 4233.)

VIC-20

1) Starbattle
2) Jelly Monsters
3) Voodoo Castle
4) Sargon Chess
5) Space Fortress
6) VIO Panic
7) Bonzo
8) Golf
9) Martian Raider
10) Another VIC in the Wall

CBM 64

1) Mangrove
2) Hitch-Hiker's Guide to the Galaxy
3) Tank Atak
4) Introduction to Basic Part 1
5) Gortek and the Microchips

(From Chromasonic, 48 Junction Road, Archway, London N19, tel 01-263 9493. Direct/mail order.)

Test your skill on the Rabbit duck shoot

They may be awkward to handle, these games for the VIC-20, but what they lack in technical quality they make up for with colour and thrills.

QUACKERS

For the unexpanded VIC

This was my favourite of the three reviewed here; it has a touch of originality, although the screen looked vaguely familiar.

The game works with the joystick only, so better hop off and get yourself one (it does repeat fire!) if you don't already own one. No instructions are displayed within the game, so you have to look at the multi-coloured screen displaying the title, author and copyright.

When the game starts the screen is vanishing somewhere. To get it back you have to press f7 and then centre it with the joystick. I see no reason why the program should not set up the screen properly for you. You lose shooting time, even if it is only a few seconds.

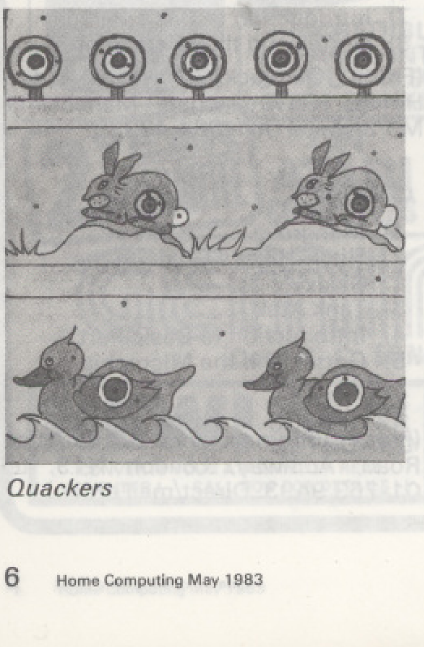
Shoot the turtle

You are at the bottom of the screen at the start of the game, shooting passing ducks and rabbits, also firing through obstacles at smiling faces. Once you've shot everything the screen clears and a turtle trots across the screen. When you shoot the turtle it trots back across the screen again, moving progressively faster. On each hit your score increases until you miss and exit up one level.

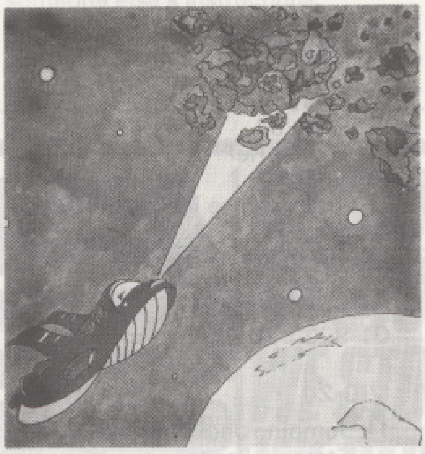
The colour is passable, and the graphics are very good except for what I presume to be the gun. The sound is suitable for the game but not brilliant.

Rabbit describe this as "interesting software". It certainly is. The game is fast and addictive. It could have been cheaper and the screen should self-centre, but otherwise no complaints.

Rabbit Software is at 380 Station Road, Middlessex, HA1 2DE.



Quackers



Myriad

MYRIAD

needs 3K expansion

Upon loading the instructions are displayed, "all four pages" of them, but at least there are some interesting colours to entertain you on the way. The instructions are easy to follow though lengthy.

Again there are six keyboard controls making the contortions necessary to play painful and slow. But you can use your joystick and the space bar as a shield for your spaceship (that's progress for you). As the name suggests, this is another version of Asteroids cum Space Limpers; your mission is to obliterate everything etc.

How about some enterprising people out there replying to Rabbit's offer to "help you earn lots of money" in exchange for "high quality software" and hopefully original. So if you need lots of money, get in touch with Rabbit Software.

I did experience a few loading problems; let's hope that these were due to a defective tape. If not, then Rabbit have been giving away lots of money for inferior software. I was disconcerted to find that the fire button on the joystick and keyboard did not repeat; this makes your zapping very tiring after a while. Could there be a moral? Like, 'War is hard work'. Certainly the fire button is.

The handling of the graphics, colour and sound is very good. These features put the game high on the addictive list. The display, sound and colour score well, but the game needs a repeat fire button.

The price (£9.99) is a little high, but Myriad is worth a look.

SKRAMBLE

For the unexpanded VIC

Sounds familiar? The instructions on the pack are clear. Once you have loaded the program you are greeted with the instructions, which are clear and precise if a little lengthy. Now you wait for the main program to load . . . yawn, ah, here it is.

The control keys are displayed before the game starts. Oh dear, I think I need another hand. Why no option for joystick control?

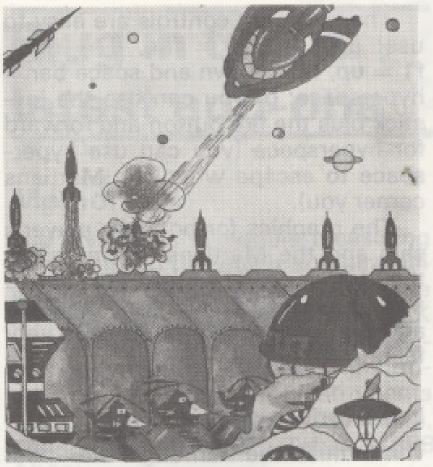
To be fair to Rabbit, even though this is yet another version of the game, it is fast and responsive. The graphics are excellent when you get a chance to see them! If you're a Zap! Pow! freak you will find this game very addictive.

Nothing special

Pity about the six keyboard controls and their positioning, they tend to make one give up on the game. The sound and colour are nothing special, pretty much standard for this type of game, but at least they don't get in the way or slow the game down.

Priced at £9.99, Skramble is expensive when compared with other software in the same price range. I know it's an often uttered gripe, but perhaps the software houses will get the prices right soon.

Beware the Gologs and the Evil Sistorian



Skramble

ARCADIA
VIC-20

This is from Imagine in Liverpool, a relatively new software house. Arcadia can be run on the unexpanded or the expanded VIC, which is a nice touch. On loading, the screen fills with strange characters, but Imagine say this is normal. I suspect it's the result of cramming the program in to run on the basic VIC. The instructions come on the cassette cover; be sure to read them well.

The game can be played using either joystick or keyboard. Imagine have programmed the keys so that you have a choice of keys to play.

Realistic

Not exactly an original game, it's a play on Invaders and Asteroids, but still excellent. The colour is good, red border and black screen, with multicoloured invader ships and player's ship. The graphics are excellent; both the player's ship and the alien ships look realistic, as do the explosions, shots and movements. The sound is above average and the speed of play makes it a 'mean' game.

The player's objective is to survive the alien attacks. You have three ships and get an extra ship for each level of attack you survive. But beware, the aliens not only attack from above but also ram you from the side. You can move from side to side and also up and down the screen with help from your thrusters.

At £5.50 Arcadia is value for money and very addictive.

MOONS OF JUPITER
needs 3K expansion

This game takes over four minutes to load, but I think you will agree it is worth the wait.

The object of the game is to blast your way through the moons of Jupiter with your destroyers, of which you have five to start. You also have a choice of three skill levels, one being the easiest and three the hardest and most addictive.

There is a choice of key controls or joystick; both are equally effective and manageable. You obtain an extra destroyer each time you clear the screen, but beware of the Gologs. You can't destroy them, although you can run away from them or cause them to collide with a planet.

Better chance

As you get better at the game you discover that you can go on and on, becoming more engrossed. Two people can play at once, thus giving a better chance of survival and a higher score. I leave it to you to discover how!

For £9.99 you get instructions to read while the main game loads, excellent graphics, good response, fast action and high score facility. Although this game has been on the market a while and no doubt has many keen fans, it is still worth a mention.

Romik run a competition for the highest score. I wonder if my 126,000 would win anything? If anyone out there has won a prize from Romik I would be interested to hear from you.

SPACE FORTRESS
For the unexpanded VIC

The loading is the same as for Moons of Jupiter. Using the unexpanded VIC does not detract from the use of colour graphics and sound.

You are left stranded in space because of a 'computer malfunction'. You have to do battle with the Evil Sistorian ship, but first you have to get through its defence forces before it goes into hyperspace and disappears. Not an entirely new idea but it lives up to expectations, except that the player's ship could be faster.

There are four levels; you start at the first level and move up one when you have survived the current level. Because of the speed of the game I did not get very far, in fact only to the second level, so I can't tell what happens after that. The colour and sound are average to good, the graphics excellent. £9.99 from Romik.

SPACE ATTACK
for the unexpanded VIC

Another Space Invaders type game, with the same colour, sound, graphics and instruction format as Space Fortress. The object of the game, if you haven't already guessed, is to zap the aliens. You have a choice of three skill levels, level one being fairly easy.

Part of the attraction of this game is that it is very fast and unpredictable; you are never quite sure where the little monsters are going next. There is a choice of keyboard or joystick control. You need to be fairly good to score well as it doesn't give you any chances but simply wipes you out.

My main grumble is that the fire button does not repeat, thus making the game harder. Perhaps this was the intention; if so Romik have created a fast, addictive and tiring game.

WACKY WAITERS
VIC-20

As with Arcadia, Wacky Waiters (also from Imagine) throws up peculiar characters on the screen after loading. The only problem I had was in getting to grips with the game and its most unusual theme.

The player is a waiter in a hotel. When the game starts you are positioned at the bottom of the screen on the left hand side. A customer beckons from the other side of the screen and you have to go to him and take his order. You travel by lifts, jumping from one lift to the other, falling if you miss the lift.

If you take too long to get the customer's order, you may be fired or lose your tip.

This is how the game keeps the score. You start with a tip of 99p, which decreases with the time taken to fill the order. The game also keeps a Hi-score, as does Arcadia. Once the order has been filled you start again; you have three lives.

Above average

There are other twists to the game, but I'll let readers discover these for themselves. Wacky Waiters runs on the basic or expanded VIC and costs £5.50. As with Arcadia, the graphics are realistic, the speed and response above average and you have a choice of keyboard controls.

POWER BLASTER

Unexpanded VIC

The player is on a peace mission to calm down hostile Martians. While the talks are under way the Martians are being cautious and laying mines in case the talks break down. The Player's task is to remove the mines while trying to avoid killing the Martians, as killing them only panics them into laying mines more quickly. Also you have to try to keep out of the Martians' way, otherwise they will wipe you out.

There are nine levels of play, nine being the easiest and one the hardest. I would advise staying on level nine until you are used to the game. The format is a maze and for those of you who are maze freaks, this one is a must.

The keyboard controls are easy to use: a = left, s = fire, d = right, f1 = up, f7 = down and space bar = hyperspace; or you can use the joystick plus the fire button and forward for hyperspace (you can use hyperspace to escape when the Martians corner you).

The graphics for both the player's ship and the Martians are fantastic, the colour and sound are above average even by Romik's standards and the response to controls is very fast.

Lower prices

This must be among the best space games for the unexpanded VIC. I would say *the* best but there are one or two software houses coming close to Romik's standards and retailing at lower prices than Romik. Power Blaster costs £9.99.

New Releases

Notes on the software market

Games

Man-eating apple monsters in Apple Panic and a thrilling cross-country car race in Motor Mania. The Magnificent Seven package features seven games: Hangman, Battleships, Asteroid Patrol, Wanted, Splash, Spider's Maze and Surround. From Audiogenic, PO Box 88, Reading, Berks. (Tel: 0734-586334).

Hordes of wasps in Kaktus, the aim being to stop them eating the giant cactus, and some malignant microbes in Mangrove. For the 64 or 20 depending on the game chosen. Supersoft, Winchester House, Wealdstone, Harrow, Middlesex (Tel: 01-861 1166).

Land surveying

A set of 10 programs for the 4000 and 8000, with versions for the 64 and 700 coming soon. All programs in the Microsurvey series are compiled and are intended for use by builders, architects, surveyors and engineers. The 4032 goes with the 4040 or 2031 disk drive and the 8032 accompanies the 8050 disk drive. Both use a 4022 printer. From Construction Measurement Systems Ltd, Hafod, Peatling Magna, Leicester LE8 3UQ (Tel: 053758-283).

Educational

A variety of school administration programs. One of them arranges timetables, another analyses exam results. For 16K or 32K PETs depending on program required. Programs usually supplied on cassette. Available from Chris Johnson or Keith Johnson at 120A, Urmston Lane, Stretford, Manchester M32 9BQ.

Education games for pupils aged five to 12. Designed to improve spelling, broaden vocabulary and teach mathematics. Number Puzzler and Hide and Seek need 16K RAM while Shape Up and Words, Words, Words require 8K or 16K RAM. From Applied Systems Knowledge Ltd, London House, 42 Upper Richmond Road West, London SW14 8DD (Tel: 01-876 0102).

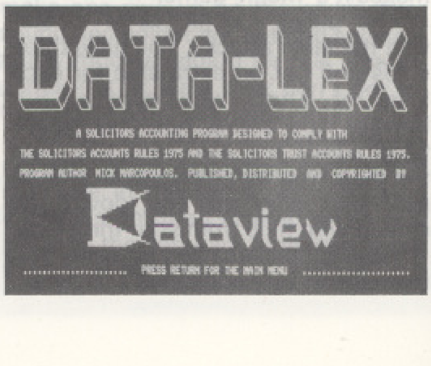
Stock control

The Anagram Stock Controller runs on the Commodore 8096 using a Corvus 20 megabyte hard disk. Multi-user access supports up to eight computers. The system records stock levels, movements and values as well as producing orders and processing invoices. Anagram, 60A Queen Street, West Sussex RH13 5AD (Tel: 0403-50854/58153).

Tax and accounting

Microtax is a set of programs which take you step by step through your tax return, advising what to fill in and calculating the total tax liability for the year. For use on the PET 400 series, VIC-20 with 16K RAM and the Commodore 64. From Microtax Ltd, Barratt House, 4th floor, 7 Chertsey Road, Woking, Surrey GU21 5AB (Tel: 04862-29369).

Data-Lex is a time recording and accounting program for solicitors produced by Dataview under the supervision of a Supreme Court solicitor. Links to Wordcraft and Executive. Dataview Ltd, Portreeves House, East Bay, Colchester CO1 2XB (Tel: 0206-869414).



DATA-LEX

A SOLICITORS ACCOUNTING PROGRAM DESIGNED TO COMPLY WITH
THE SOLICITORS ACCOUNTS RULES 1975 AND THE SOLICITORS TRUST ACCOUNTS RULES 1975.
PROGRAM AUTHOR NICK MARCOPOULOS. PUBLISHED, DISTRIBUTED AND COPYRIGHTED BY

Dataview

.... PRESS RETURN FOR THE MAIN MENU ....

Peripherals

Plug in to the latest add-ons

Memory

The NVR64 is a module measuring 4in × 2in × 1in which contains 64 Kbytes of CMOS static RAM. The NVR64 may be used as two 32K blocks with 16K PETs, automatically upgraded to 32K. More information from Greenwich Instruments Ltd, 22 Bardsley Lane, Greenwich, London SE10 9RF (Tel: 01-853 0868).

NVR64
64K x 8
NONVOLATILE
MEMORY MODULE
GREENWICH INSTRUMENTS LIMITED
LONDON

Speech

The speech synthesizer designed by Currah Computer Components Ltd can be used on the VIC via the expansion port or through Currah's motherboard. Adman Electronics Ltd have the UK, European and Japanese marketing rights for both products. For more information, contact Thomas E. Bergman and Partners, North House, 17 North Street, Newcastle-upon-Tyne NE1 8DF (Tel: 0632-323535).

Business

Producing budgets, reports or statements? Got the 8000 or 64? CalcResult is a spreadsheet program in three-dimensional format with 32 pages per project, graphics and colour facilities. CalcResult costs £94 and is available from Kobra Micro Marketing, Duramark House, Farm Road, Henley-on-Thames, Oxon RG9 1PF (Tel: 04912-2512).

Word processing

Spellpro and Mailpro are add-ons to Paperclip. Spellpro can be expanded to include up to 80,000 words. Mailpro holds 4000 records on a standard 8050 diskette. Both can be used with Paperclip simultaneously and both are from Kobra Micro Marketing.

Gallid Superwriter II

Printing technology

Superwriter II is an 80/132 column dot matrix printer that can be linked to Commodore machines via the RS232 interface. The printer houses a Centronics interface which accepts 8 bit parallel data as well as IEEE-488. Forty and 132 characters per line with 6 or 8 lines to the inch. From Gallid Ltd, 1 Bilton Road, Rugby, Warwickshire (Tel: 0788-74442).

Stands

Also from Gallid Ltd is a range of made-to-measure computer trolleys which ensure that the equipment is at the correct operating height for the user. The base comprises five urethane legs on castors. The trolley costs £69.90 and comes with a five year guarantee.

Update

Virgin play the games market

Along with Nick Alexander (left), who successfully launched Thorn EMI's home computer software range in the UK and North America, Richard Branson, chairman of the Virgin Group, has set up a new subsidiary called Virgin Games Ltd to meet UK and international demand for software and video games. Some of these programs run on the 64 and the VIC-20.

According to Nick Alexander, who will head the subsidiary, the company aims to be innovative. "We want to see the UK take a leading role in computer software as it once did in other entertainment industries like music, films and books." He promises aggressive marketing at a time when the industry has yet to grow out of the mail order columns into the high street.

All Virgin need now is a supply of exciting and original games with good graphics. Enthusiasts should send their programs to Virgin Games Ltd, 61–63 Portobello Road, London W11.

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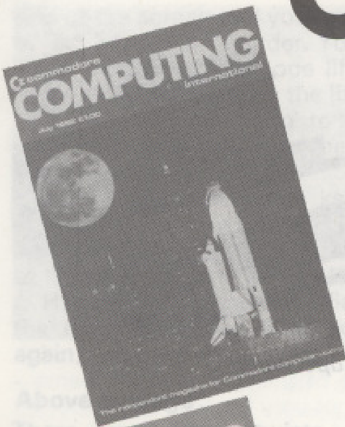
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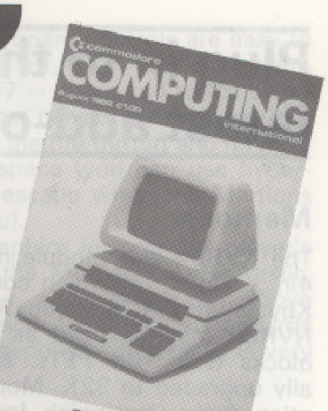
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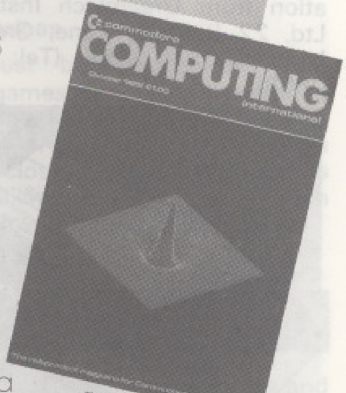
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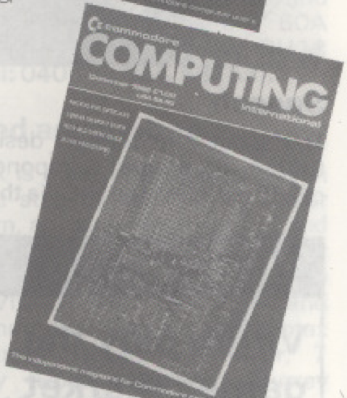
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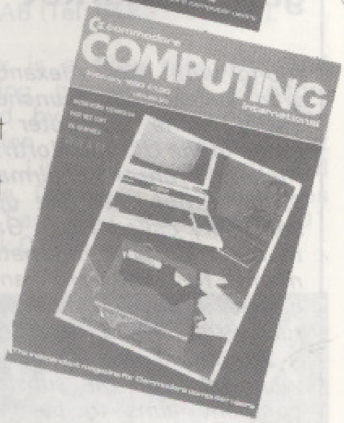
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Dual cassette controller

By M. G. Pickford

This simple circuit will enable a VIC-20 to communicate alternatively to two cassette drives. The VIC can then search and copy from one tape drive to the other. As the files are loaded into the VIC they can be compared with a file already in the VIC and saved, or updated and saved on the other tape drive.

For example, consider a program for storing names and addresses in files on tape. I'll call them A, B, C, D and E. The VIC displays a list of the files on tape and the operator chooses one, e.g. C. The VIC then searches the master tape in tape drive 1 and when it finds file C it loads and displays it.

Could be lost

Now consider the problem of a change of address where the new address is longer than the old. Unless the files have been recorded with a large space in between, the updated file information could be lost on the other files during recording.

With my system the VIC will prompt the operator to rewind the master tape in drive 1 and to load a blank tape into drive 2. The VIC will then load file A and compare it with file C (previously loaded). If it is not the updated file C, it will save file A on drive 2.

The VIC will then be ready to load the next file B and repeat the process as for file A. When the file C is loaded and compared, the updated version is saved instead of the old. The remaining files (D and E) would also be loaded and saved as with file A. The operator now has a new tape with all the old files in the same order, but with an updated file C. The old tape can be used as the blank for the next database update.

Switched

The circuit in Figure 1 consists of a relay driven by a transistor. The transistor is switched from one of the user port terminals and hence so is the relay. There are six wires communicating between the VIC and the tape drive; only three need to be switched from one to the other, the rest being wired to both drives. These are the 9 volt supply to the motor, the "read" wire and the switch sense wire.

As I could not see the need for both tape drives to be in record mode, the "write" wire only goes to one tape drive.

To change the relay over and hence the tape drives, a poke to the data direction register to select output, then a poke to the output register, 0 or 1, will switch the tape over.

I have not gone into construction details because any 3-pole changeover relay with a 6 to 12 volt coil will suffice. The same goes for the transistor; any N.P.N. (or P.N.P. – remember to reverse the power rails) which is capable of sinking the current of the chosen relay will do. I should point out that the pin marked +9 volts on the user port edge connector is 9 volts AC and has to be rectified and smoothed before it drives the relay (DI and CI in fig. 1A).

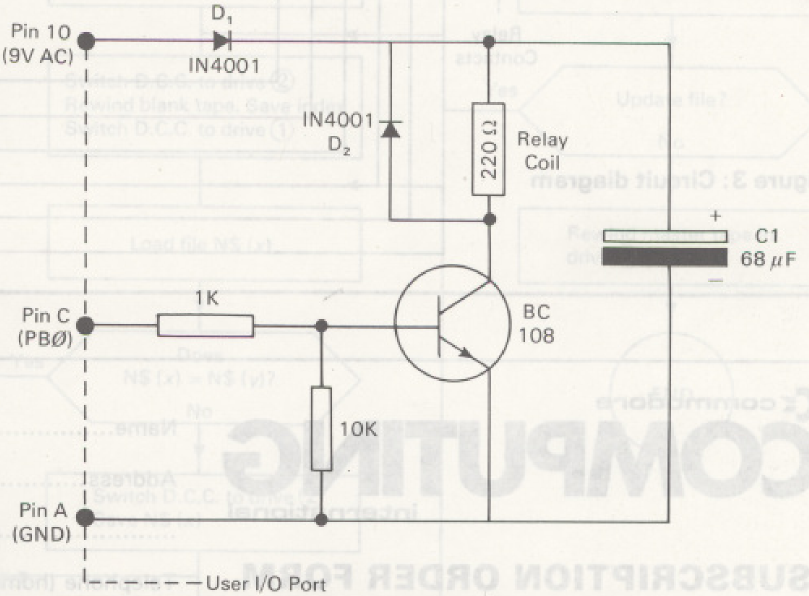

Figure 1: Circuit diagram of the dual cassette controller

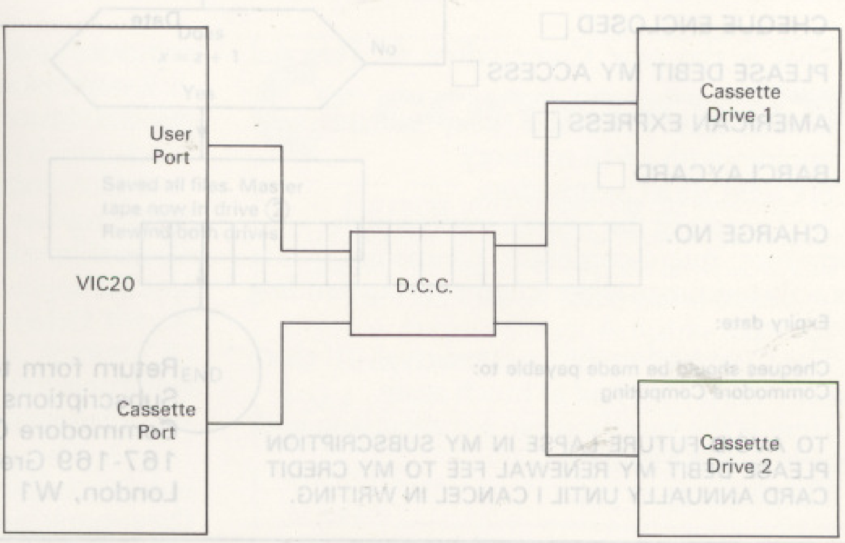

Figure 2: D.C.C. connection diagram

This system of mass data storage is very slow, but it's cheap and reliable. Considering the software side of the system, it is quite straightforward to change over tape drives, but, for example, if the first file on tape holds the titles of all the other files on tape, you can add and subtract files without stopping the program.

Should you run out of RAM, you could split the files into smaller files and page them onto the screen. The possibilities are endless, but don't forget to save your program on a third tape.

I suggest you read *Commodore Computing* while the VIC is updating the files as it can take a long time.

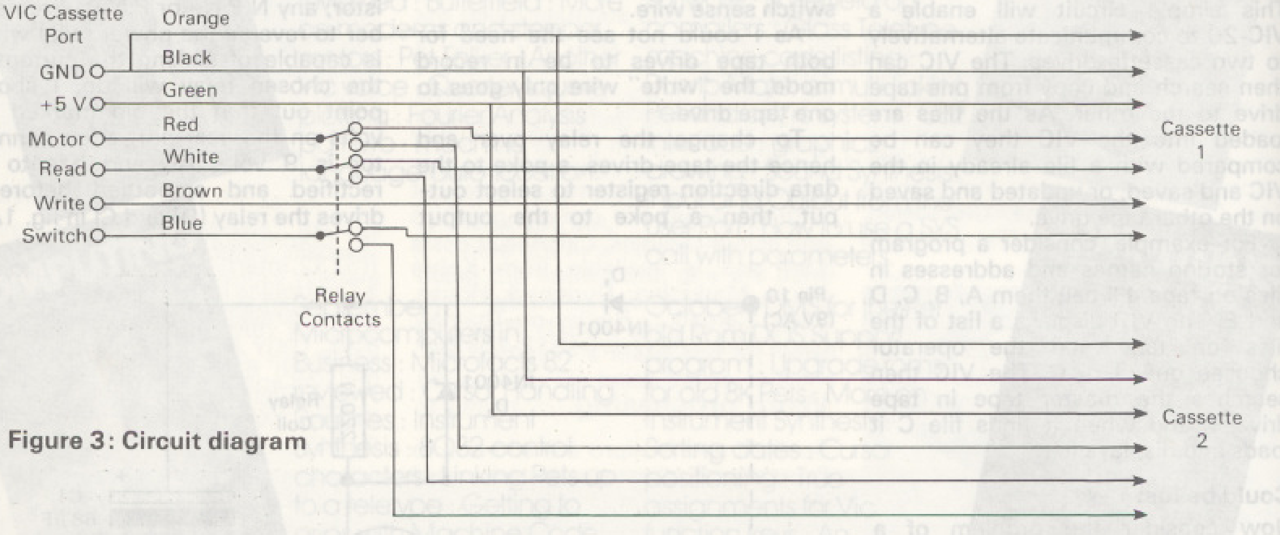

Figure 3: Circuit diagram

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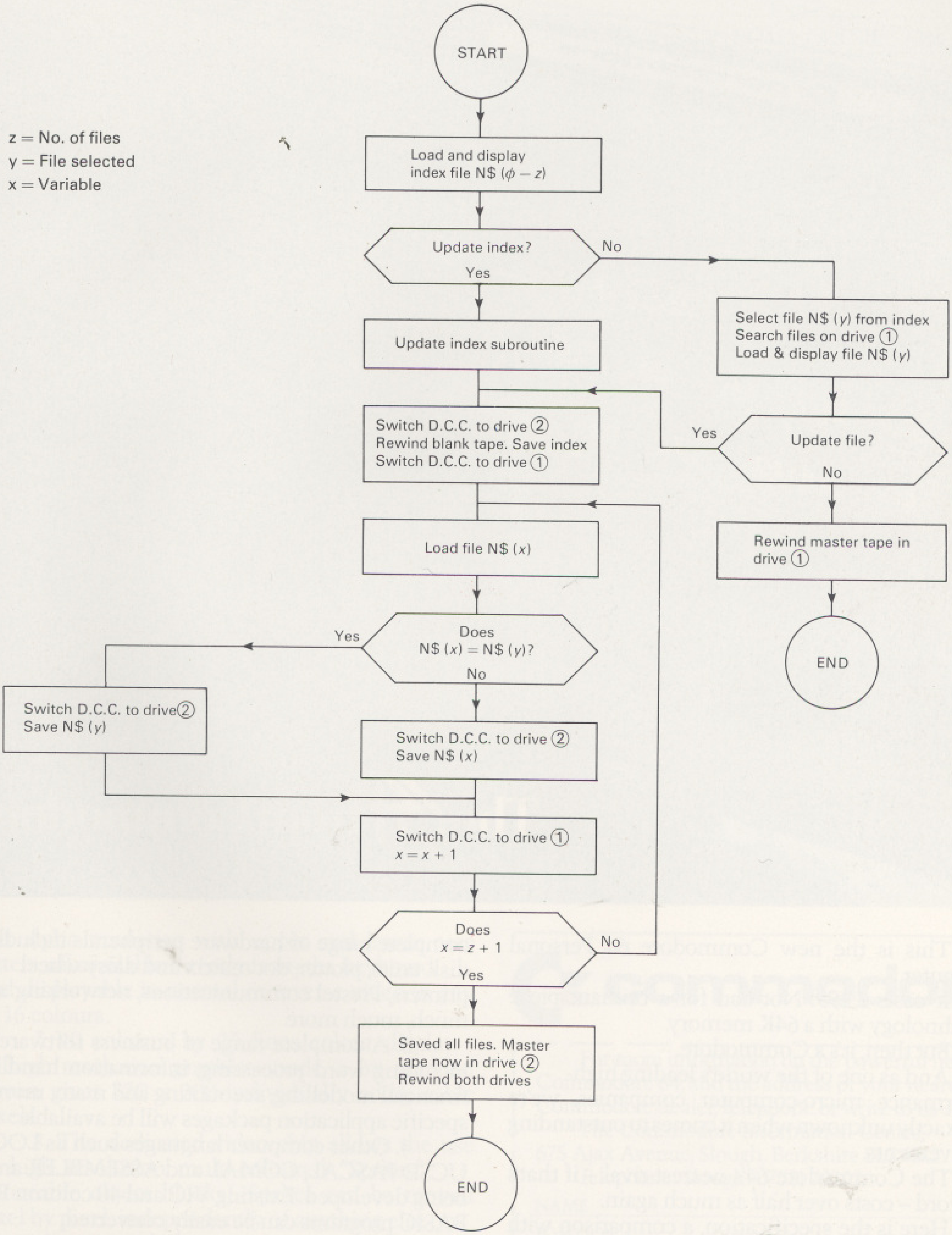
z = No. of files
y = File selected
x = Variable
START
Load and display index file N$ (ϕ − z)
Update index?
No
Yes
Update index subroutine
Select file N$ (y) from index
Search files on drive ①
Load & display file N$ (y)
Switch D.C.C. to drive ②
Rewind blank tape. Save index
Switch D.C.C. to drive ①
Yes
Update file?
No
Rewind master tape in drive ①
END
Load file N$ (x)
Yes
Does N$ (x) = N$ (y)?
No
Switch D.C.C. to drive②
Save N$ (y)
Switch D.C.C. to drive ②
Save N$ (x)
Switch D.C.C. to drive ①
x = x + 1
Does x = z + 1
No
Yes
Saved all files. Master tape now in drive ②
Rewind both drives
END

Figure 4: Flow chart

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1. A total memory capacity of 64K; 38K directly available to BASIC. When not using BASIC a full 54K is available for machine code programs.

2. Interface adaptors will allow the use of a complete range of hardware peripherals including disk units, plotter, dot matrix and daisy wheel printers, Prestel communications, networking and much, much more.

3. A complete range of business software including word processing, information handling, financial modelling, accounting and many more specific application packages will be available.

4. Other computer languages such as LOGO, UCSD PASCAL, COMAL and ASSEMBLER are being developed. Existing VIC and 40 column PET BASIC programs can be easily converted.

5. The powerful sound chip gives 3 totally independent voices each with a range of 9 octaves. User control over music envelope, pitch and pulse shapes provides the ability to make your Commodore 64 sound like a variety of musical instruments, solo or in harmony.

6. 62 predefined graphic characters plus

full alpha numerics with upper and lower case letters, all available directly from the keyboard and displayable in normal or reverse video in any of 16 colours.

7. 40 column by 25 lines colour display. In high resolution graphics mode, a bit mapped screen gives 320 x 200 individually addressable pixels.

8. The dedicated video chip allows the use of high resolution multi-coloured "Sprites" (moveable object blocks). Sprites can be moved pixel by pixel, independently of anything else on the screen.

9. Sprites can also be set up in 8 "layers" giving full 3 dimensional effects with, if required, automatic collision detection between sprites and any other screen object.

10. Machine bus port will accept ROM cartridges for many applications, including business, educational, home and leisure software.

11. A second processor option using the Z80 gives the Commodore 64 the ability to support CP/M.®

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The 64 jug and skiffle band

Conducted by Jim Butterfield

Meet Bearcat Zeke, Old Man Mose, Fiddlin' Fran and Snaredrum Sammy. Playing the harmonisqueeze, the gut bucket and the hanging jug, they'll bring the sounds of good ole Tennessee into your living room.

Somewhere up in the hills of Commodore county, there's a jug band and skiffle group that gathers from time to time. I'd like to introduce you to the players, and show you how to program your 64 to hear them play.

This is a basic band playing basic music, so you can write your program in Basic. Later, you may want to change instruments and add to the group's repertoire. With the 64 sound chip, it's not hard to do.

We're going to be the bandleader, so we must set up the instruments and choose the type of play. Here we go:

```
100 print "MUSIC (By Jim
Butterfield)"
```

Now let's locate the musicians:

```
110 l1=54272:l2=54279:
     l3=54286
120 h1=l1+1:h2=l2+1:
     h3=l3+1
130 v1=l1+4:v2=l2+4:
     v3=l3+4
```

Each musician stands in a "spot" marked by a number. As band director, we'll call up the music for each one by signalling each player's spot, using his "address". The L's and H's will be used to name the pitch of the notes; the V locations are used for the other stuff.

```
140 poke 54296, 15
```

This tells the listeners to turn up their hearing aids, so they can hear the group playing. The highest volume we can set is 15 and that's the one we pick,

```
150 poke v1+1, 9:poke v1+2, 0
```

Player 1 is young Billy; he plays the hanging jugs. When he hits a jug with his corncob drumstick it will sound right away and come out with a good clunking sound (that's the 9, for fast sound attack and fulsome decay). But he can't strum the jug or hold the sound, so that note will fade away soon after he plays (that's the 0, for no sound sustain or release).

```
160 poke v2+1, 36:poke v2+2,
     36
```

Player 2 is Bearcat Zeke, who plays the harmonisqueeze. When Zeke puffs into his instrument, it takes a moment for the sound to build up (we pick 36, for a medium speed attack and moderate decay). Once he winds up the note, he can hold it for quite a while (we set 36 for medium sustain and release).

```
170 poke v3+1, 18:poke v3+2,
     250
```

Old Man Mose is in slot number 3; he plays a traditional gut bucket. When he strums the cord, he gets a fast, full sound (we'll pick 18 for fast attack and medium decay). Once the cord is in motion, it holds the sound for a while before it fades away (250 for a full slow sound decline).

```
180 t=ti
```

Let's check our digital watches so we can get the band playing in time.

```
200 poke v1, 16:poke v2, 32:
     poke v3, 16
```

Here's where we give each instrument its individual sound. Billy and Old Man Mose have instruments that produce a clear, soft sound. For them, we pick a "triangle" waveform, code 16. Zeke's contraption makes a sharper, snarly sound; we give it an edge with the "sawtooth", code 32.

We're doing something else important here. By using *even* numbers, we're telling the boys: hands off the instruments. Billy, take your corncob away from the jugs; Zeke, don't blow into that thing; and Old Man Mose, hands off the string. Later, we'll tell them to "hit it" with an *odd* number to the same location.

It's time to play some music. Let's read the notes.

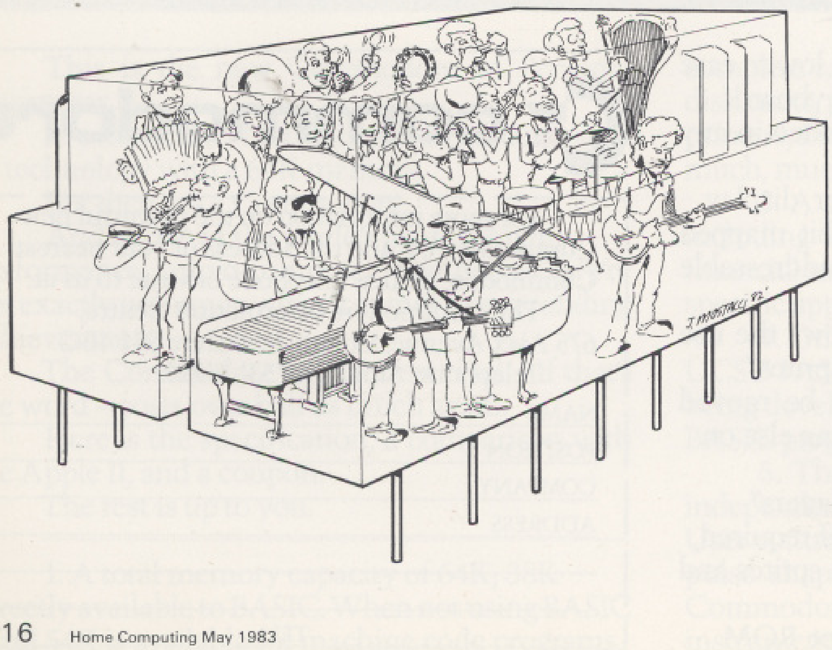
```
210 read s: if s=0 goto 290
```

First, let's get the timing. If the note timing is zero, we must be finished, because we can't play that fast.

```
220 read x1, y1, x2, y2, x3, y3
```

Let's get the notes. Each note is broken into two pieces; that's the way we feed it to the band. If the note is zero, we have nothing to play this time around.

```
230 if x1 then poke h1, x1:poke
     l1, y1:poke v1, 17
240 if x2 then poke h2, x2:poke
     l2, y2:poke v2, 33
250 if x3 then poke h3, x3:poke
     l3, y3:poke v3, 17
```



The original version of this article appeared in the Canadian journal, *The Transactor*. Thanks to them for permission to reprint. Thanks also to Karl Hildon, who helped develop the programs.

If a player has something to play (his note is not zero) we'll put his note into the proper slot, and then tell him to "hit it", by making his waveform numbers odd—remember line 200 where we told everyone hands off?

In fact, we're going to go back to 200 later and tell the fellows to let go. If we didn't, they wouldn't be able to play the next note. But first, let's do some timing.

```
260 t=t+s
```

Let's set the clock ahead so we can tell when this note has been played long enough. This way, we can wait until the note has had its full time:

```
270 if t>ti goto 270
```

When the note has played, we'll go back and do it all again with:

```
280 goto 200
```

and when the music is finished, we tell the band to take a break, until the next tune. Turn off the instruments.

```
290 for j=l1 to 54296:poke j,
    0:next j
```

That's all very well, but we'll need some music to play. Here it comes:

```
300 data  10,  51,  97,    0,   0,   0,   0
310 data  10,  43,  52,    0,   0,   0,   0
320 data  20,  34,  75,   21, 154,   8, 147
330 data  20,  34,  75,   25, 177,   0,   0
340 data  10,  34,  75,   17,  37,   6, 108
350 data  10,  38, 126,    0,   0,   0,   0
360 data  10,  43,  52,   25, 177,   0,   0
370 data  10,  45, 198,    0,   0,   0,   0
400 data  20,  51,  97,   21, 154,   8, 147
410 data  20,  51,  97,   25, 177,   0,   0
420 data  20,  51,  97,   17,  37,   9, 159
430 data  20,  43,  52,   25, 177,  10, 205
440 data  20,  57, 172,   22, 227,  11, 114
450 data  20,  57, 172,   34,  75,   0,   0
460 data  20,  57, 172,   28, 214,   8, 147
470 data  10,   0,   0,   34,  75,   0,   0
480 data  10,  51,  97,    0,   0,   0,   0
500 data  20,  57, 172,   22, 227,  11, 114
510 data  10,   0,   0,   34,  75,   0,   0
520 data  10,  51,  97,    0,   0,   0,   0
530 data  10,  57, 172,   28, 214,  10, 205
540 data  10,  64, 188,    0,   0,   0,   0
550 data  10,  68, 149,   34,  75,   9, 159
560 data  10,  76, 252,    0,   0,   0,   0
600 data  20,  86, 105,   21, 154,   8, 147
610 data  20,   0,   0,   25, 177,   0,   0
620 data  20,   0,   0,   17,  37,   6, 108
630 data  10,  68, 149,   25, 177,   0,   0
640 data  10,  51,  97,    0,   0,   0,   0
650 data  20,  68, 149,   21, 154,   8, 147
660 data  20,   0,   0,   25, 177,   0,   0
670 data  20,   0,   0,   17,  37,   8,  23
680 data  10,  51,  97,   25, 177,   7,  53
690 data  10,  43,  52,    0,   0,   0,   0
700 data  20,  51,  97,   22, 227,   6, 108
710 data  20,   0,   0,   25, 177,   0,   0
720 data  20,   0,   0,   19,  63,   9, 159
730 data  10,  38, 126,   25, 177,   0,   0
740 data  10,  43, 100,    0,   0,   0,   0
750 data  20,  34,  75,   21, 154,   8, 147
760 data  20,   0,   0,   25, 177,   6, 108
770 data  20,   0,   0,   21, 154,   4,  73
780 data  20,   0,   0,    0,   0,   0,   0
790 data   0
```

That's the whole thing. You can add to the music, change the instruments, change the timing or do whatever else you like.

If you'd like to listen to the instruments one or two at a time, you can silence any player by changing the appropriate line 230–250 to a REM line. You could delete the line, but REM is better – it saves typing when you want to bring the instrument back.

An easy way to change the speed of a tune is to change line 260; by multiplying or dividing variable S by an appropriate factor, the band can turn frantic or ease back into lazy playing.

If you change the waveform, remember that there are two places to do it: line 200 and the appropriate line of 230–250.

There are a couple of waveforms that we haven't used: we've stayed with triangle (16) and sawtooth (32) instruments. If you want to bring in Fiddlin' Fran, she will need a pulse waveform (64), and you'll need to supply a *pulse width* by setting values into (for instrument 1) V1-1 and/or V1-2. Snaredrum Sammy will want a noise waveform (128). Don't forget to add 1 when you want the instrument played.

The group mostly plays southern music. But on a pleasant warm night when visitors stop to listen, they might just try a northern tune:

```
300 data  20,  34,  75,   21, 154,   8, 147
310 data  20,  34,  75,   25, 177,   0,   0
320 data  20,  38, 126,   28, 214,   6, 108
330 data  20,  43,  52,   25, 177,   0,   0
340 data  20,  34,  75,   21, 154,   8, 147
350 data  20,  43, 180,   25, 177,   0,   0
360 data  20,  38, 126,   22, 227,   8,  23
370 data  20,   0,   0,   25, 177,   0,   0
400 data  20,  34,  75,   21, 154,   8, 147
410 data  20,  34,  75,   25, 177,   0,   0
420 data  20,  38, 126,   28, 214,   6, 108
430 data  20,  43,  52,   25, 177,   0,   0
440 data  20,  34,  75,   21, 154,   8, 147
450 data  20,   0,   0,   25, 177,   0,   0
460 data  20,  32,  94,   22, 227,   8,  23
470 data  20,   0,   0,   19,  63,   6, 108
500 data  20,  34,  75,   21, 154,   8, 147
510 data  20,  34,  75,   25, 177,   0,   0
520 data  20,  38, 126,   21, 154,   7, 163
530 data  20,  43,  52,   17,  37,   0,   0
540 data  20,  45, 198,   28, 214,   7,  53
550 data  20,  43,  52,   34,  75,   0,   0
560 data  20,  38, 116,   28, 214,   0, 206
570 data  20,  34,  75,   22, 227,   0,   0
600 data  20,  32,  94,   25, 177,   6, 108
610 data  20,  25, 177,   22, 227,   0,   0
620 data  20,  28, 214,   21, 154,   7,  53
630 data  20,  32,  94,   19,  63,   8,  23
640 data  20,  34,  75,   21, 154,   8, 147
650 data  20,   0,   0,   25, 177,   6, 108
660 data  20,  34,  75,   21, 154,   4,  73
670 data  20,   0,   0,    0,   0,   0,   0
700 data   0
```

The final program is for those who prefer their music British.

```
300 DATA 10,50,60,0,0,0,0
310 DATA 20,67,15,42,62,8,97
320 DATA 10,67,15,0,0,0,0
330 DATA 10,67,15,44,193,6,71
340 DATA 10,63,75,0,0,0,0
350 DATA 10,56,99,0,0,0,0
360 DATA 20,50,60,42,62,8,97
370 DATA 10,44,193,37,162,0,0
380 DATA 20,42,62,33,135,6,108
390 DATA 10,50,60,0,0,0,0
400 DATA 20,67,15,42,62,8,97
410 DATA 10,67,15,0,0,0,0
420 DATA 20,75,69,44,193,9,104
430 DATA 10,63,75,37,162,0,0
440 DATA 50,67,15,42,62,0,97
450 DATA 10,50,60,0,0,0,0
460 DATA 20,67,15,42,62,8,97
470 DATA 10,75,69,0,0,0,0
480 DATA 20,84,125,44,193,6,71
490 DATA 10,89,131,0,0,0,0
500 DATA 20,100,121,42,62,8,97
510 DATA 10,85,125,37,162,0,0
520 DATA 20,67,15,33,135,10,143
530 DATA 10,75,69,0,0,0,0
540 DATA 20,84,125,50,60,8,97
550 DATA 10,84,125,0,0,0,0
560 DATA 10,84,125,50,60,7,12
570 DATA 10,75,69,44,193,0,0
580 DATA 10,67,15,42,62,0,0
590 DATA 50,75,69,44,193,6,71
600 DATA 10,50,60,0,0,0,0
610 DATA 20,67,15,42,62,8,97
620 DATA 10,75,69,0,0,0,0
630 DATA 20,84,125,44,193,6,71
640 DATA 10,89,131,0,0,0,0
650 DATA 20,100,121,42,62,8,97
660 DATA 10,85,125,37,162,0,0
670 DATA 20,67,15,33,135,10,143
680 DATA 10,75,69,0,0,0,0
690 DATA 20,84,125,50,60,8,97
700 DATA 10,84,125,0,0,0,0
710 DATA 10,84,125,50,60,7,12
720 DATA 10,75,69,44,193,0,0
730 DATA 10,67,15,42,62,0,0
740 DATA 30,75,69,44,193,6,71
750 DATA 20,84,125,50,60,0,0
760 DATA 10,75,69,44,193,0,0
770 DATA 20,67,15,42,62,8,97
780 DATA 10,67,15,0,0,0,0
790 DATA 10,67,15,44,193,6,71
800 DATA 10,63,75,0,0,0,0
810 DATA 10,56,99,0,0,0,0
820 DATA 20,50,60,42,62,8,97
830 DATA 10,44,193,37,162,0,0
840 DATA 20,42,62,33,135,6,108
850 DATA 10,50,60,0,0,0,0
860 DATA 20,67,15,42,62,8,97
870 DATA 10,67,15,0,0,0,0
880 DATA 20,75,69,44,193,9,104
890 DATA 10,63,75,37,162,0,0
900 DATA 50,67,15,42,62,8,97
910 DATA 0,0,0,0,0
920 DATA 0
```

Running PET programs on a VIC

By Steven Darnold

Converting programs from one type of computer to run on a different type is usually quite difficult. Although the VIC and the PET are similar enough for most VIC programs in Basic to be run on the PET without too much trouble, VIC owners wanting to run PET programs will need to make several alterations.

Because the PET has nearly twice as many columns as the VIC, some PRINT statements will be broken in the middle of words and wrap around to the next line. Usually this is easily fixed by breaking up the PRINT statements. However, on some occasions, it is necessary for one PET line to end up as one VIC line.

For example, a PRINTed chess board cannot have the tail-end of each row wrapping around to the next line. In this case it is necessary to compress the PET line (usually by removing spaces). Sometimes the wrap-around is so bad that the VIC user has difficulty figuring out what is supposed to be happening. In this case it may be helpful to discard the excess characters on each line until the pattern is clearer.

Values reduced

Other commands affected by the VIC's 22-column screen are POS, TAB and SPC. POS is most often used to test for the end of a line, in which case it will need to be reduced by about 18. TAB, SPC and comma are used to format printing on the screen. Their values will have to be reduced to fit the VIC screen and some of the printing may have to be abbreviated.

Usually an INPUT in a PET program will occur on the same line as its prompt. However, the VIC does not like wrapping around on an INPUT, so it is usually best to start INPUTs on a fresh line. Therefore a statement like INPUT"prompt";A$ should be changed to PRINT"prompt":INPUTA$.

Many PET programs have three spaces and three cursor-lefts at the end of a prompt to avoid dropping out of the program on a null input. Since the VIC does not stop on a null input, such extra characters at the end of prompts can be left out.

The further a PET program is from mainstream Basic, the more difficult it will be to convert. Since PEEK, POKE and WAIT address specific memory locations, it may be awkward to find the equivalent locations in the VIC. SYS and USR are even worse because they jump to machine language routines.

The accompanying chart lists the most frequently used addresses for PEEK, POKE and WAIT and gives suggestions for conversions to the VIC. PEEKs and POKEs to the screen are not so simply dealt with. Because the PET screen is laid out in rows of 40, vertical lines are POKEd by taking steps of 40; and diagonal lines, by steps of 39 or 41.

On the VIC, however, vertical lines require steps of 22 and diagonal lines, steps of 21 or 23. VIC users will have to change screen offsets of 39, 40, 41 to 39, −40 and −41. 32768 is the upper left corner of the PET screen, 32807 is the upper right, 33728 is the lower left and 33767 is the lower right. VIC owners doing conversions are advised to rule off a 25 × 40 grid and number the squares accordingly.

Usually PET programs containing a SYS or USR are too difficult to convert. Even a knowledge of 6502 machine language may not be enough.

Sometimes the SYS or USR can simply be left out. For example, a popular SYS routine flashes on the screen. Dropping such a SYS does no harm.

Common addresses for PEEK, POKE and WAIT

40 - 53	pointers : identical to Vic 43 - 56
141 - 143	clock : Vic 160 - 162
144	POKE 144,PEEK(144)+3 is used to disable the stop key
151	PEEK(151) is used to see which key is held down (255 = none). Vic 197 (64 = none). Values returned are different from PET ones.
152	WAIT 152,1 waits until the shift key is pressed. Vic 653.
158	Number of characters in keyboard buffer. Vic 198.
166	Similar to Pet 151 : Vic 203.
167	POKE 167,0 turns on cursor. Vic 204.
623 - 632	Keyboard buffer. Vic 631 to 640.
634 - 1017	Cassette buffers. Machine Code is often POKEd into this area : easy conversion is unlikely. Vic 828 - 1019.
32768-33767	Screen memory : see accompanying article.
59464	POKE 59464 plays note (1=high, 255=low).
59466	POKE 59466 sets octave for note (15=low, 51=mid, 85=low).
59467	POKE 59467,16 turns on sound (0=off).
59468	POKE 59468,14 sets upper/lower case. 12 = graphics.

Reverse character routine

By John Consadine

The machine code routine described here was written for a 3032 40-column PET and the VIC-20. It resides in the second cassette buffer but is easily relocatable by altering the first two data statement values. Its function is to reverse any $ characters present on the screen instantly on typing SYS 826 and convert to normal text with SYS 882.

These SYS commands can be liberally sprinkled throughout a program to reverse the character at any time. This can prove useful in business programs, to highlight a section of the screen, or in games programs, to make your space invader etc. flash without slowing down the action.

The routine can be changed to flash any alphanumeric or graphic character by changing the two sets of numbers as shown.

The first four numbers ringed (36) are the POKE code for the $ character. The second four ringed numbers (164) are the POKE code for the *reversed* $ character. Hence, any reversed and non-reversed character codes may be substituted, e.g.

Character	$	#	*	@
Non-rev. code	36	35	42	0
Rev. code	164	163	170	128

Character	▙	ϕ	♥	space
Non-rev. code	127	48	83	32
Rev. code	255	176	211	160

In fact, if the top of memory is poked low enough, any number of these routines may be loaded into successive slots by choosing appropriate values for the first two data statements. These dictate where the routine will reside and can be accessed by a SYS call to the first data number.

Just type in the loader program, RUN and then NEW. The following short program will give you an example of the effect:

```
10   REM-$ FLASH EXAMPLE
20   FORX=1TO333:
     PRINT"$20";:NEXT
30   FORY=1TO200:NEXT
40   SYS826
50   FORZ=1TO200:NEXT
60   SYS882
70   GOTO30
```

The PET routine runs without modification on 80 column machines but will only effect the top half of the screen (i.e. 1000 characters).

```
 10 REM************************
 15 REM-$ FLASH ROUTINE
 20 REM 40 COLUMN PET/CBM
 25 REM
 30 REM-J.CONSADINE 25/2/83
 40 REM
 50 REM-ACTIVATE AS FOLLOWS:-
 60 REM REVERSE ON- SYS826
 70 REM REVERSE OFF- SYS882
 80 REM************************
 90 REM
 100 READL,H:FORI=LTOH:READDT:POKEI,DT:NEXT
 1000 DATA 826, 937
 1010 DATA 162,0,189,0,128,201,36,208,5,73,128,157,0,128,189,250
 1020 DATA 128,201,36,208,5,73,128,157,250,128,189,244,129,201,36,208
 1030 DATA 5,73,128,157,244,129,189,238,130,201,36,208,5,73,128,157
 1040 DATA 238,130,232,224,250,208,203,96,162,0,189,0,128,201,164,208
 1050 DATA 5,73,128,157,0,128,189,250,128,201,164,208,5,73,128,157
 1060 DATA 250,128,189,244,129,201,164,208,5,73,128,157,244,129,189,238
 1070 DATA 130,201,164,208,5,73,128,157,238,130,232,224,250,208,203,96
READY.
```

```
 10 REM************************
 15 REM $ FLASH ROUTINE
 20 REM VIC 20
 25 REM
 30 REM J.CONSADINE 25/2/83
 40 REM
 50 REM ACTIVATE AS FOLLOWS:-
 60 REM REVERSE ON- SYS826
 70 REM REVERSE OFF- SYS882
 80 REM************************
 90 REM
 100 READL,H:FORI=LTOH:READDT:POKEI,DT:NEXT
 1000 DATA 826, 937
 1010 DATA 162,0,189,0,30,201,36,208,5,73,128,157,0,30,189,115
 1020 DATA 30,201,36,208,5,73,128,157,115,30,189,230,30,201,36,208
 1030 DATA 5,73,128,157,230,30,189,89,31,201,36,208,5,73,128,157
 1040 DATA 89,31,232,224,115,208,203,96,162,0,189,0,30,201,164,208
 1050 DATA 5,73,128,157,0,30,189,115,30,201,164,208,5,73,128,157
 1060 DATA 115,30,189,230,30,201,164,208,5,73,128,157,230,30,189,89
 1070 DATA 31,201,164,208,5,73,128,157,89,31,232,224,115,208,203,96
READY.
```

Beat your machine to a line of five

This game, for the VIC-20, is a computer version of a traditional game from the Orient called Gomoko or Gomoku. The board is set up in a 10 × 10 grid and the object of the game is to put your disks in a line of five: horizontal, vertical or diagonal.

The computer will try to stop you from making the line and at the same time try to make a line itself. As the computer has to consider all possible moves, there is a long pause while it chooses the best move. The program requires a 3K expansion cartridge.

```
5 DIM VMAX(2),NF(2),WD(2,20,4)
6 DIM BD(10,10),DB(20)
100 GOSUB 60000
105 GOSUB 400
110 GOSUB 2000
120 GOSUB 8000
150 GOSUB 5000
180 IF VMAX(2)=19 THEN WIN=2:GOTO 300
190 GOSUB 3000
200 IF VMAX(1)>=14 THEN WIN =1:GOTO 300
220 GOTO 110
300 IF WIN=1 THENPRINT"▓I WIN            ▓":STOP
310 PRINT"▓YOU WIN           ▓"
320 END
400 R1=INT(RND(TI)*6)+3
410 C1=INT(RND(TI)*6)+3
420 PF=7796+22*R1+C1
430 POKE PF,81:POKE PF+30720,5
440 RETURN
2000 INPUT "▓▓YOUR MOVE▓▓";R$,C$
2010 PRINT"▓                ";"▓";
2040 R=VAL(R$):C=ASC(C$)-64
2050 IF ABS(R-5.5)>4.5 OR ABS(C-5.5)>4.5THENGOSUB 63000
2055 P=7796+22*R+C
2060 D=PEEK(P)
2070 IF D=46 THEN 2120
2080 PRINT"SPACE OCCUPIED"
2090 PA=120:GOSUB 63000
2100 PRINT"▓                      ▓";
2110 GOTO 2000
2120 POKE P,87:POKE P+30720,2
2130 RETURN
3000 FOR A=1 TO 2
3010 IF VMAX(A)<14 GOTO 3040
3020 GOSUB 51000
3030 RETURN
3040 NEXT A
3100 FOR A=1 TO 2
```

```
3110 IF VMAX(A)<10 THEN 3140
3115 IF A=2 AND VMAX(2)<12 AND VMAX(1)=9THEN 3140
3120 GOSUB 50000
3130 RETURN
3140 NEXT A
3141 FOR A=1 TO 2
3142 IF VMAX(A)<9 THEN 3145
3143 GOSUB 50000
3144 RETURN
3145 NEXT A
3146 PMAX=0:NT=0
3150 FOR R1=1 TO 10
3160 FOR C1=1 TO 10
3170 IF BD(R1,C1)=0 THEN 3240
3180 P=BD(R1,C1)
3190 IF P<PMAX THEN 3240
3200 IF P=PMAX THEN 3220
3210 NT=0:PMAX=P
3220 NT=NT+1
3230 RM(NT)=R1:CM(NT)=C1
3240 NEXT C1,R1
3250 PN=INT(RND(1)*NT)+1
3260 PF=7796+22*RM(PN)+CM(PN)
3270 POKE PF,81:POKE PF+30720,5
3280 RETURN
5000 V=0
5005 FORIL=1 TO 2
5008 VMAX(IL)=0:NF(IL)=0
5009 NEXT IL
5100 RL=1:RU=6
5110 CL=1:CU=10:F=22
5120 GOSUB 6000
5150 RL=1:RU=10
5160 CL=1:CU=6:F=1
5170 GOSUB6000
5200 RL=1:RU=6
5210 CL=1:CU=6:F=23
5220 GOSUB6000
5250 RL=1:RU=6
5260 CL=5:CU=10:F=21
5270 GOSUB6000
5300 RETURN
6000 FOR R=RL TO RU
6005 S=7796+22*R
6010 FOR C=CL TO CU
6020 SS=S+C
6030 FOR I=0 TO 4
6035 CD=SS+F*I
6040 D=PEEK(CD)
6050 IF D=46 THEN DW(I)=CD:GOTO 6090
6060 IF TP=0 THEN TP=D:II=((TP-81)/6+1).
6070 IFTP<>D THEN V=0:TP=0:GOTO 6300
6080 V=V+5-ABS(I-2)
6085 DW(I)=0
6090 NEXT I
6100 IF V=0 THEN 6300
6110 IF V<VMAX(II) THENV=0:GOTO 6168
6120 IF V=VMAX(II) THEN 6140
6130 NF(II)=0:VMAX(II)=V
6140 NF(II)=NF(II)+1
```

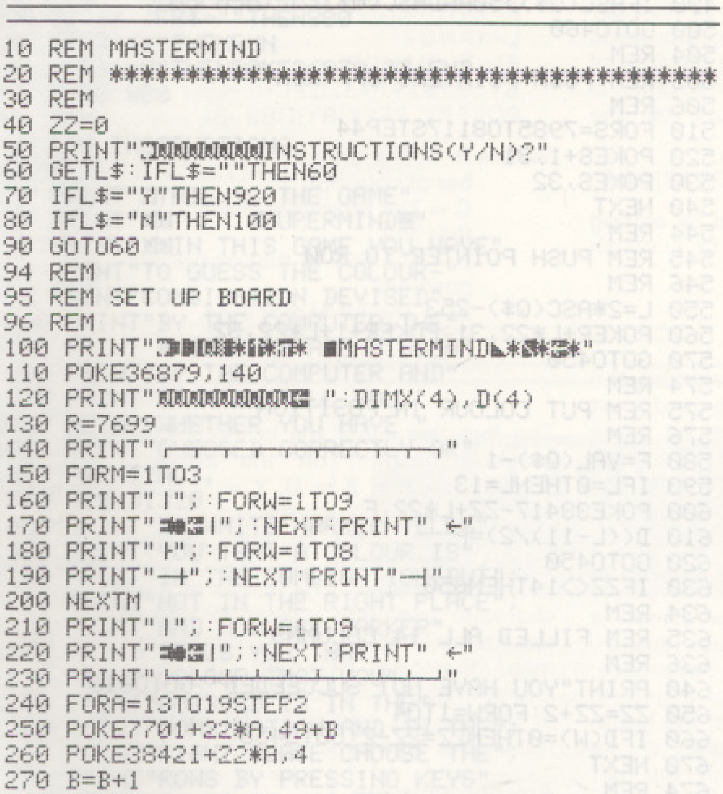
```
6150 FOR J=0 TO 4
6160 WD(II,NF(II),J)=DW(J)
6165 NEXT J
6168 FOR J=0 TO 4
6169 IFDW(J)=0 THEN6210
6170 DD=DW(J)-7796
6180 R1=INT(DD/22)
6190 C1=DD-22*R1
6200 BD(R1,C1)=BD(R1,C1)+1
6210 NEXT J
6220 V=0:TP=0
6300 NEXT C,R
6310 RETURN
8000 FOR R=1 TO 10
8010 FOR C=1 TO 10
8020 BD(R,C)=0
8025 NF(II)=NF(II)+1
8030 NEXT C,R
8040 RETURN
50000 PMAX=0:NT=0
50010 FOR I=1 TO NF(A)
50020 FOR J=0 TO 4
50030 P=WD(A,I,J)
50040 IF P=0 THEN 50120
50050 R1=INT((P-7796)/22)
50060 C1=(P-7796)-22*R1
50070 IF BD(R1,C1)<PMAX THEN 50120
50080 IF BD(R1,C1)=PMAX THEN 50100
50090 NT=0:PMAX=BD(R1,C1)
50100 NT=NT+1
50110 DB(NT)=P
50120 NEXT J
50125 IF A=2 AND PMAX=1 THEN 50160
50130 PN=INT(RND(1)*NT)+1
50140 POKE DB(PN),81:POKE DB(PN)+30720,5
50150 RETURN
50160 GOSUB 3145
50170 RETURN
51000 FOR J=0 TO 4
51010 IF WD(A,1,J)=0 THEN 51030
51020 P=WD(A,1,J)
51030 NEXT J
51040 POKE P,81:POKE P+30720,5
51050 RETURN
60000 PRINT"▓▓▓▓"
60010 PRINTTAB(7);"ABCDEFGHIJ"
60020 PRINTTAB(6);"▓▒▒▒▒▒▒▒▒▒▒▓"
60025 NN=4
60030 FOR I=1 TO 10
60035 IF I>9 THEN NN=3
60040 PRINTTAB(NN);STR$(I)+"▓▓..........▓▓"
60050 NEXT I
60060 PRINTTAB(6);"▓▒▒▒▒▒▒▒▒▒▒▓";
60100 WIN =0
60999 RETURN
63000 T1=TI
63010 IF TI-T1<PA THEN 63010
63020 RETURN

READY.
```

Mastermind in colour

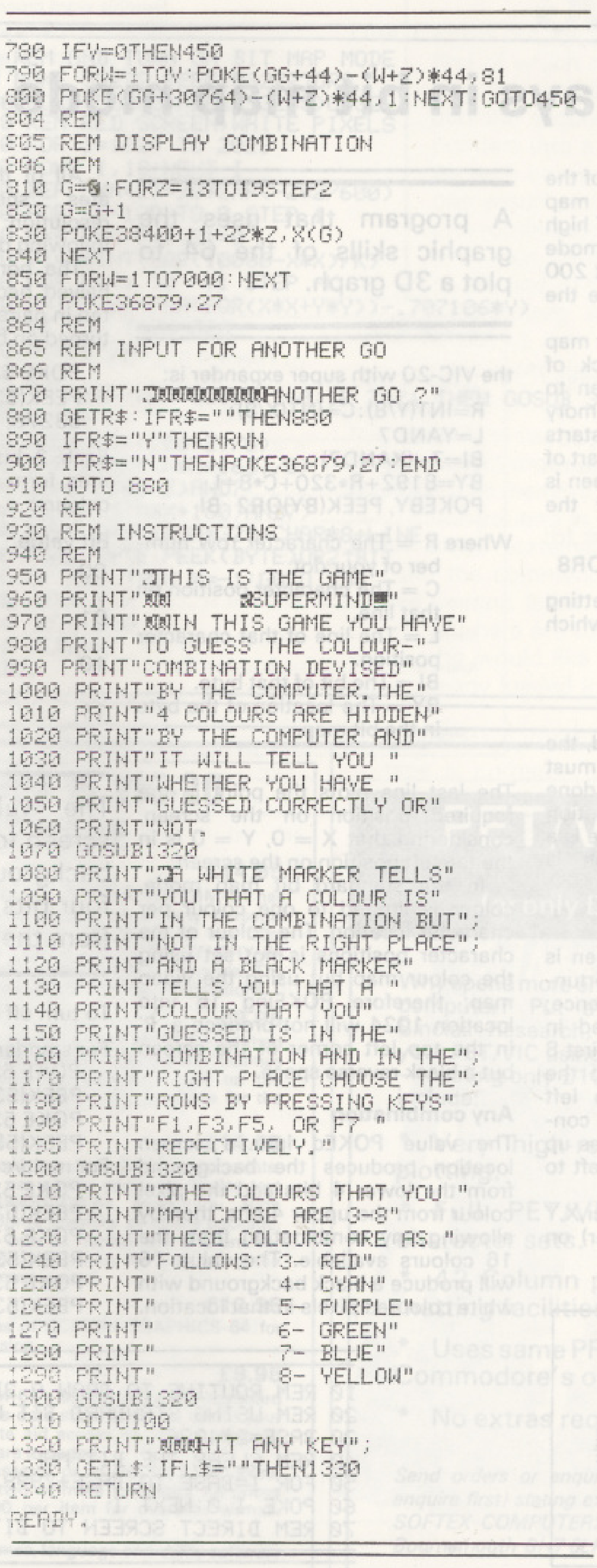
This computer version of Mastermind makes use of colour. The positions are chosen by hitting the respective function keys and then tapping a number that corresponds to the colour required. When a colour has been inserted into each of the four locations, hitting RETURN will enter them to the computer, which tells you how you did on that guess.

You are the guesser all the time but apart from that it's an enjoyable game. As the function keys are being used, the super expander cartridge will not allow you to play the game properly, but it will fit into the basic VIC-20.



```
10 REM MASTERMIND
20 REM ****************************************
30 REM
40 ZZ=0
50 PRINT"▓▓▓▓▓▓▓▓▓INSTRUCTIONS(Y/N)?"
60 GETL$:IFL$=""THEN60
70 IFL$="Y"THEN920
80 IFL$="N"THEN100
90 GOTO60
94 REM
95 REM SET UP BOARD
96 REM
100 PRINT"▓▓▓▓*▓*▓* ▓MASTERMIND▓*▓*▓*"
110 POKE36879,140
120 PRINT"▓▓▓▓▓▓▓▓▓▓ ":DIMX(4),D(4)
130 R=7699
140 PRINT"┌┬┬┬┬┬┬┬┬┐"
150 FORM=1TO3
160 PRINT"|";:FORW=1TO9
170 PRINT"▓▓|";:NEXT:PRINT" ←"
180 PRINT"├";:FORW=1TO8
190 PRINT"─┼";:NEXT:PRINT"─┤"
200 NEXTM
210 PRINT"|";:FORW=1TO9
220 PRINT"▓▓|";:NEXT:PRINT" ←"
230 PRINT"└┴┴┴┴┴┴┴┴┘"
240 FORA=13TO19STEP2
250 POKE7701+22*A,49+B
260 POKE38421+22*A,4
270 B=B+1
280 NEXT
284 REM
285 REM CHOOSE RANDOM COLOURS,ALL DIFFERENT
286 REM
290 X(1)=INT(RND(1)*6)+2
300 X(2)=INT(RND(1)*6)+2
310 IFX(2)=X(1)THEN300
320 X(3)=INT(RND(1)*6)+2
330 IFX(3)=X(1)ORX(3)=X(2)THEN320
340 X(4)=INT(RND(1)*6)+2
350 IFX(4)=X(1)ORX(4)=X(2)ORX(4)=X(3)THEN340
360 G=0
370 FORZ=13TO19STEP2
380 G=G+1
```

```
390 POKE38400+1+22*Z,0:POKE7681+22*Z,102
400 NEXT
404 REM
405 REM WHITE "●'S" IN EVERY POSITION
406 REM
410 FORY=13TO19STEP2
420 POKE7680+1+22*Y,81
430 NEXTY
440 FORW=1TO250:NEXT:PRINT"♥"
450 I=44:GG=7939-ZZ
454 REM
455 REM INPUT + CHECK FOR ILLEGAL KEY PRESS
460 GETQ$:IFQ$=""THEN450
470 IFASC(Q$)=13THEN630
480 IFASC(Q$)>132ANDASC(Q$)<137THEN510
490 IFASC(Q$)>50ANDASC(Q$)<57THEN580
500 GOTO460
504 REM
505 REM PUSH POINTERS OFF ROW
506 REM
510 FORS=7985TO8117STEP44
520 POKES+1,31
530 POKES,32
540 NEXT
544 REM
545 REM PUSH POINTER TO ROW
546 REM
550 L=2*ASC(Q$)-253
560 POKER+L*22,31:POKER+1+L*22,32
570 GOTO450
574 REM
575 REM PUT COLOUR IN POSITION
576 REM
580 F=VAL(Q$)-1
590 IFL=0THENL=13
600 POKE38417-ZZ+L*22,F
610 D((L-11)/2)=F
620 GOTO450
630 IFZZ<>14THEN650
634 REM
635 REM FILLED ALL 14 COLUMNS
636 REM
640 PRINT"YOU HAVE NOT SUCCEEDED":GOTO810
650 ZZ=ZZ+2:FORW=1TO4
660 IFD(W)=0THENZZ=ZZ-2:GOTO450
670 NEXT
674 REM
675 REM CHECK FOR BLACK REPLY
676 REM
680 Z=0:V=0
690 FORT=1TO4:IFX(T)=D(T)THENZ=Z+1
700 NEXT
704 REM
705 REM CHECK FOR WHITE REPLY
706 REM
710 FORE=1TO4:FORH=1TO4:IFX(E)=D(H)THENV=V+1
720 NEXT:NEXT:V=V-Z
730 FORW=1TO4:D(W)=0:NEXT
740 IFZ=0THEN790
744 REM
745 REM DISPLAY REPLY
746 REM
750 FORW=1TOZ:POKE(GG+44)-W*44,81
760 POKE(GG+30764)-W*44,0:NEXT
770 IFZ=4THEN810
```



```
780 IFV=0THEN450
790 FORW=1TOV:POKE(GG+44)-(W+Z)*44,81
800 POKE(GG+30764)-(W+Z)*44,1:NEXT:GOTO450
804 REM
805 REM DISPLAY COMBINATION
806 REM
810 G=0:FORZ=13TO19STEP2
820 G=G+1
830 POKE38400+1+22*Z,X(G)
840 NEXT
850 FORW=1TO7000:NEXT
860 POKE36879,27
864 REM
865 REM INPUT FOR ANOTHER GO
866 REM
870 PRINT"▣▩▩▩▩▩▩▩▩▩ANOTHER GO ?"
880 GETR$:IFR$=""THEN880
890 IFR$="Y"THENRUN
900 IFR$="N"THENPOKE36879,27:END
910 GOTO 880
920 REM
930 REM INSTRUCTIONS
940 REM
950 PRINT"▣THIS IS THE GAME"
960 PRINT"▩▩      ▩SUPERMIND▩"
970 PRINT"▩▩IN THIS GAME YOU HAVE"
980 PRINT"TO GUESS THE COLOUR-"
990 PRINT"COMBINATION DEVISED"
1000 PRINT"BY THE COMPUTER.THE"
1010 PRINT"4 COLOURS ARE HIDDEN"
1020 PRINT"BY THE COMPUTER AND"
1030 PRINT"IT WILL TELL YOU "
1040 PRINT"WHETHER YOU HAVE "
1050 PRINT"GUESSED CORRECTLY OR"
1060 PRINT"NOT.
1070 GOSUB1320
1080 PRINT"▣A WHITE MARKER TELLS"
1090 PRINT"YOU THAT A COLOUR IS"
1100 PRINT"IN THE COMBINATION BUT";
1110 PRINT"NOT IN THE RIGHT PLACE";
1120 PRINT"AND A BLACK MARKER"
1130 PRINT"TELLS YOU THAT A "
1140 PRINT"COLOUR THAT YOU"
1150 PRINT"GUESSED IS IN THE"
1160 PRINT"COMBINATION AND IN THE";
1170 PRINT"RIGHT PLACE CHOOSE THE";
1180 PRINT"ROWS BY PRESSING KEYS"
1190 PRINT"F1,F3,F5, OR F7 "
1195 PRINT"REPECTIVELY."
1200 GOSUB1320
1210 PRINT"▣THE COLOURS THAT YOU "
1220 PRINT"MAY CHOSE ARE 3-8"
1230 PRINT"THESE COLOURS ARE AS "
1240 PRINT"FOLLOWS: 3- RED"
1250 PRINT"          4- CYAN"
1260 PRINT"          5- PURPLE"
1270 PRINT"          6- GREEN"
1280 PRINT"          7- BLUE"
1290 PRINT"          8- YELLOW"
1300 GOSUB1320
1310 GOTO100
1320 PRINT"▩▩▩HIT ANY KEY";
1330 GETL$:IFL$=""THEN1330
1340 RETURN
READY.
```

Hi-res displays in bit map mode

A program that uses the graphic skills of the 64 to plot a 3D graph.

One of the graphic capabilities of the 64 is to use the screen in bit map mode, enabling the user to 'plot' high resolution displays. In standard mode the resolution available is 320 x 200 pixels and in multi-colour mode the resolution is 160 x 200.

The method for setting up bit map mode is to clear an 8K block of memory and redirect the screen to that 8K block. The block of memory used in the example program starts at location 8192 which is the start of the 8th kilobytes block. The screen is directed at that memory by the command:

```
POKE 53272, PEEK(53272)OR8
```

Bit map mode is selected by setting bit 5 of the VIC-11 chip to 1, which is location 53265 thus:

```
POKE 53265
PEEK(53265)OR32.
```

When bit map mode is required, the 8K block of memory being used must be cleared. This cannot be done simply by typing CLR; each location must have a 0 sent to it, so there is a long pause before the graph is plotted.

Character locations

Each line of pixels on the screen is represented by 5 bytes but unfortunately they are not in sequence; instead the bytes are arranged in character locations so that the first 8 bytes of the bit map make up the character location in the top left corner of the screen. Each consecutive group of 8 bytes makes up the next character going from left to right across the screen.

The equivalent to POINT cr,X,Y (where cr is the colour register) on the VIC-20 with super expander is:

```
R=INT(Y/8):C=INT(X/8):
L=YAND7
BI=7-(XAND7)
BY=8192+R*320+C*8+L
POKEBY, PEEK(BY)OR2 BI
```

Where R = The character row number of your dot.
C = The character position on that line.
L = The line of that character position.
BI = The bit of that byte.
BY = The location of the byte in the bit map.

The last line plots the point in the required position on the screen, considering that X = 0, Y = 0 is in the top left position on the screen.

In the standard bit map mode, colour is limited to one colour per character location. The colour of the character positions is not set using the colour map but using the video map; therefore POKEing 16 into location 1024 will not produce a 'P' in the top left corner of the screen but a black reverse space.

Any combination

The value POKEd into a screen location produces the background from the lower 4 bits and the pixel colour from the upper 4 bits, thereby allowing any combination from the 16 colours available. The value 16 will produce a black background with white coloured pixels in that location.

All of the above information relates specifically to standard resolution. For multi-colour mode the following differences must be noted:

The horizontal or X resolution is halved because the pixels are plotted in pairs. The multi-colour mode is turned on by:

```
POKE 53265,
PEEK(53265)OR32:POKE
53270, PEEK(53270)OR16
```

Each 2 bits in the display memory area form a dot with a choice of 4 colours:

Bit value	Colour
00	Background colour (loc 53281)
01	Upper half of the screen memory
10	Lower half of the screen memory (dot off).
11	Value in colour nybble memory.

The value poked into a screen location produces the background from the lower four bits and the pixel colour from the upper four bits.

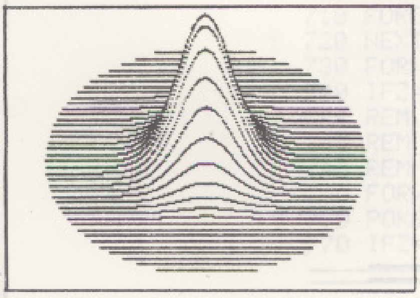
To turn off bit map mode:

For standard mode:

```
POKE 53265,
PEEK(53265)AND223
POKE 53272,
PEEK(53272)AND247
```

For multi/c mode:

```
POKE 53265,
PEEK(53265)AND223
POKE 53270,
PEEK(53270)AND239
POKE 53272,
PEEK(53272)AND247
```



3D graph print-out

```
10 REM ROUTINE TO DRAW A 3D GRAPH
20 REM USING STANDARD BIT MAP MODE
30 BASE=2*4096
40 REM CLEAR THE BIT MAP
50 FOR I=BASE TO BASE+7999
60 POKE I,0:NEXT I
70 REM DIRECT SCREEN TO BIT MAP
```

```
 80 REM AND TURN ON BIT MAP MODE
 90 POKE 53272,PEEK(53272)OR8
 100 POKE 53265,PEEK(53265)OR32
 110 REM RED SCREEN,WHITE PIXELS
 120 FOR I=1024 TO 2023
 130 POKE I,18:NEXT I
 140 DEF FNA(Z)=90*EXP(-Z*Z/600)
 150 FOR X=-100 TO 0 STEP 1
 160 K=6:L=0:P=1:Z1=0
 170 Y1=K*INT(SQR(10000-X*X)/K)
 180 FOR Y=Y1 TO -Y1 STEP -K
 190 Z=INT(80+FNA(SQR(X*X+Y*Y))-.707106*Y)
 200 IF Z<L THEN 320
 210 GOSUB 340
 220 L=Z
 230 IF P=0 THEN GOSUB 340:IF Z=Z1 THEN GOSUB 340
 240 M=1
 250 ROW=INT((200-Z)/8)
 260 CHAR=INT((M*X+160)/8)
 270 LINE=(200-Z)AND7
 280 BIT=7-((M*X+160)AND7)
 290 BYTE=BASE+ROW*320+CHAR*8+LINE
 300 POKE BYTE,PEEK(BYTE)OR2↑BIT
 310 IF M=1 THEN M=-1:GOTO 250
 320 NEXT Y,X
 330 GOTO 330
 340 RETURN
READY.
```

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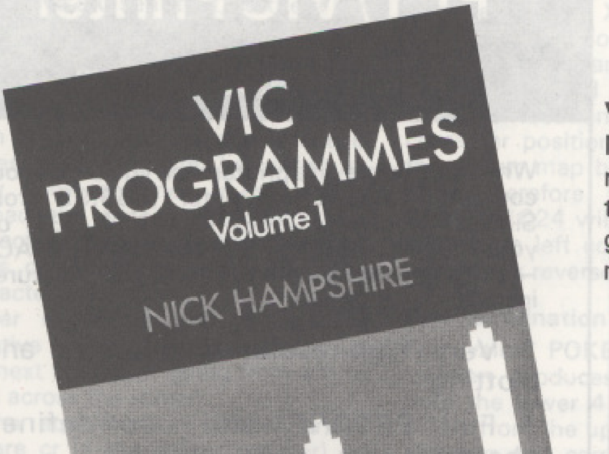

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